3GPP TS 04.18 V8.12.0 (2001-12)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group GSM EDGE Radio Access Network; Mobile radio interface layer 3 specification, Radio Resource Control Protocol (Release 1999)

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

Keywords
GSM, radio, access, network, layer 3, protocol

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword 13

1 Scope 14
1.1 Scope of the Technical Specification 14
1.2 Application to the interface structures 14
1.3 Structure of layer 3 procedures 14
1.4 Test procedures 14
1.5 Use of logical channels 15
1.6 Overview of control procedures 15
1.6.1 List of procedures 15
1.7 Applicability of implementations 16
1.7.1 Voice Group Call Service (VGCS) and Voice Broadcast Service (VBS) 16
1.7.2 General Packet Radio Service (GPRS) 17

2 References 17
2.1 Definitions and abbreviations 20
2.1.1 Random values 20
2.1.2 Vocabulary 20

3 Radio Resource management procedures 22
3.1 Overview/General 22
3.1.1 General 22
3.1.2 Services provided to upper layers 22
3.1.2.1 Idle mode 22
3.1.2.2 Dedicated mode 22
3.1.2.3 Group receive mode 23
3.1.2.4 Group transmit mode 23
3.1.2.5 Packet idle mode 23
3.1.2.6 Packet transfer mode 24
3.1.2.7 Dual transfer mode (DTM) 24
3.1.3 Services required from data link and physical layers 24
3.1.4 Change of dedicated channels 24
3.1.4.1 Change of dedicated channels using SAPI = 0 24
3.1.4.2 Change of dedicated channels using other SAPIs than 0 25
3.1.5 Procedure for Service Request and Contention Resolution 25
3.1.6 Preemption 25
3.2 Idle mode procedures and general procedures in packet idle and packet transfer modes 26
3.2.1 Mobile Station side 26
3.2.2 Network side 27
3.2.2.1 System information broadcasting 27
3.2.2.2 Paging 28
3.3 RR connection establishment 29
3.3.1 RR connection establishment initiated by the mobile station 29
3.3.1.1 Entering the dedicated mode : immediate assignment procedure 29
3.3.1.1.1 Permission to access the network 29
3.3.1.1.2 Initiation of the immediate assignment procedure 30
3.3.1.1.3 Answer from the network 30
3.3.1.1.4 Assignment completion 32
3.3.1.1.5 Abnormal cases 33
3.3.1.2 Entering the group transmit mode: uplink access procedure 33
3.3.1.2.1 Mobile station side 34
3.3.1.2.2 Network side 35
3.3.1.2.3 Abnormal cases 35
3.3.1.3 Dedicated mode and GPRS 35
3.3.2 Paging procedure for RR connection establishment 35
3.3.2.1 Paging initiation by the network 35
3.3.2.1.1 Paging initiation using paging subchannel on CCCH 36
3.3.2.1.2 Paging initiation using paging subchannel on PCCCH 37

3.3.2.1.3 Paging initiation using PACCH 37
3.3.2.2 Paging response 37
3.3.2.3 Abnormal cases 37
3.3.3 Notification procedure 38
3.3.3.1 Notification of a call 38
3.3.3.2 Joining a VGCS or VBS call 38
3.3.3.3 Reduced NCH monitoring mechanism 39
3.3.3.4 Notification response procedure 40
3.4 Procedures in dedicated mode and in group transmit mode 40
3.4.1 SACCH procedures 40
3.4.1.1 General 40
3.4.1.2 Measurement Report and Enhanced Measurement Report 41
3.4.1.2.1 Parameters for Measurements and Reporting 41
3.4.1.3 Extended measurement report $(MAFA)$ 44
3.4.2 Transfer of messages and link layer service provision 44
3.4.3 Channel assignment procedure 44
3.4.3.1 Channel assignment initiation 45
3.4.3.2 Assignment completion 46
3.4.3.3 Abnormal cases 46
3.4.4 Handover procedure 47
3.4.4.1 Handover initiation 48
3.4.4.2 Physical channel establishment 50
3.4.4.2.1 Finely synchronized cell case 50
3.4.4.2.2 Non synchronized cell case 50
3.4.4.2.3 Pseudo-synchronized cell case 51
3.4.4.2.4 Pre-synchronized cell case 51
3.4.4.3 Handover completion 51
3.4.4.4 Abnormal cases 52
3.4.4a Handover to UTRAN procedure 53
3.4.4a.1 Handover to UTRAN initiation 53
3.4.4a.2 Handover to UTRAN completion 53
3.4.4a.3 Abnormal cases 54
3.4.4b Handover to CDMA2000 procedure 54
3.4.4b.1 Handover to CDMA2000 initiation 54
3.4.4b.2 Handover to CDMA2000 completion 55
3.4.4b.3 Abnormal cases 55
3.4.5 Frequency redefinition procedure 55
3.4.5.1 Abnormal cases 56
3.4.6 Channel mode modify procedure 56
3.4.6.1 Normal channel mode modify procedure 56
3.4.6.1.1 Initiation of the channel mode modify procedure 56
3.4.6.1.2 Completion of channel mode modify procedure 57
3.4.6.1.3 Abnormal cases 57
3.4.6.2 Channel mode modify procedure for a voice group call talker 57
3.4.6.2.1 Initiation of the channel mode modify procedure 57
3.4.6.2.2 Completion of mode change procedure 57
3.4.6.2.3 Abnormal cases 57
3.4.7 Ciphering mode setting procedure 57
3.4.7.1 Ciphering mode setting initiation 58
3.4.7.2 Ciphering mode setting completion 58
3.4.8 Additional channel assignment procedure 59
3.4.8.1 Additional assignment procedure initiation 59
3.4.8.2 Additional assignment procedure completion 59
3.4.8.3 Abnormal cases 59
3.4.9 Partial channel release procedure 59
3.4.9.1 Partial release procedure initiation 59
3.4.9.2 Abnormal cases 60
3.4.10 Classmark change procedure 60
3.4.11 Classmark interrogation procedure 60
3.4.11.1 Classmark interrogation initiation 60
3.4.11.2 Classmark interrogation completion 60
3.4.12 Indication of notifications and paging information 61

3.4.13 RR connection release procedure 61
3.4.13.1 Normal release procedure 61
3.4.13.1.1 Channel release procedure initiation in dedicated mode and in group transmit mode 61
3.4.13.1.2 Abnormal cases 62
3.4.13.2 Radio link failure in dedicated mode or dual transfer mode 63
3.4.13.2.1 Mobile side 63
3.4.13.2.2 Network side 63
3.4.13.3 RR connection abortion in dedicated mode or dual transfer mode 64
3.4.13.4 Uplink release procedure in group transmit mode 64
3.4.13.5 Radio link failure in group transmit mode 64
3.4.13.5.1 Mobile side 64
3.4.13.5.2 Network side 64
3.4.14 Receiving a RR STATUS message by a RR entity. 64
3.4.15 Group receive mode procedures 65
3.4.15.1 Mobile station side 65
3.4.15.1.1 Reception of the VGCS or VBS channel 65
3.4.15.1.2 Monitoring of downlink messages and related procedures 65
3.4.15.1.3 Uplink reply procedure 66
3.4.15.1.4 Leaving the group receive mode 66
3.4.15.2 Network side 67
3.4.15.2.1 Provision of messages on the VGCS or VBS channel downlink 67
3.4.15.2.2 Release of the VGCS or VBS Channels 68
3.4.15.3 Failure cases 68
3.4.16 Configuration change procedure 68
3.4.16.1 Configuration change initiation 68
3.4.16.2 Configuration change completion 69
3.4.16.3 Abnormal cases 69
3.4.17 Mapping of user data substreams onto timeslots in a multislot configuration 69
3.4.18 Handling of classmark information at band change 69
3.4.19 Assignment to a Packet Data channel 70
3.4.19.1 Assignment to PDCH initiation 70
3.4.19.2 Completion of the Assignment to PDCH procedure 71
3.4.19.3 Abnormal cases 71
3.4.20 RR-Network Controlled Cell Change Order 72
3.4.20.1 RR-network controlled cell change order initiation 72
3.4.20.2 Network controlled cell reselection completion 73
3.4.20.3 Abnormal cases 73
3.4.21 Application Procedures 74
3.4.21.1 General 74
3.4.21.2 Location Services (LCS) 74
3.4.21.3 Application Information Transfer 74
3.4.21.3.1 Normal Procedure without Segmentation 74
3.4.21.3.2 Normal Procedure with Segmentation 74
3.4.21.3.3 Abnormal Cases 75
3.4.22 RR procedures related to packet resource establishment while in dedicated mode 75
3.4.22.1 Packet request procedure while in dedicated mode 75
3.4.22.1.1 Entering the dual transfer mode 76
3.4.22.2 Packet notification procedure in dedicated mode 78
3.4.22.2.1 Packet notification initiation by the network 79
3.4.22.2.2 Packet notification response 79
3.4.22.3 Packet downlink assignment in dedicated mode 79
3.4.22.3.1 Initiation of the packet downlink assignment procedure in dedicated mode 79
3.4.22.3.2 Packet downlink assignment completion 80
3.4.22.3.3 Abnormal cases 80
3.4.22.4 Modification of packet resources while in DTM 80
3.4.23 RR procedures related to packet resource maintenance while in dual transfer mode 81
3.4.24 RR procedures related to packet resource release while in dual transfer mode 81
3.4.25 GPRS suspension procedure 81
3.4.25.1 General 81
3.4.25.2 MS in class B mode of operation 81
3.4.25.3 Dual transfer mode not supported 81
3.4.26 GPRS Transparent Transport Procedure 82

3.5 RR procedures on CCCH related to temporary block flow establishment 82
3.5.1 Packet paging procedure using CCCH 82
3.5.1.1 Packet paging initiation by the network 82
3.5.1.2 On receipt of a packet paging request 83
3.5.2 Packet access procedure using CCCH 83
3.5.2.1 Entering the packet transfer mode: packet access procedure 83
3.5.2.1.1 Permission to access the network 84
3.5.2.1.2 Initiation of the packet access procedure: channel request 84
3.5.2.1.3 Packet immediate assignment 85
3.5.2.1.4 Packet access completion 89
3.5.2.1.5 Abnormal cases 89
3.5.2.2 Sending an RLC/MAC control message: single block packet access procedure 89
3.5.3 Packet downlink assignment procedure using CCCH 89
3.5.3.1 Entering the packet transfer mode: packet downlink assignment procedure 90
3.5.3.1.2 Initiation of the packet downlink assignment procedure 90
3.5.3.1.3 Packet downlink assignment completion 92
3.5.3.1.4 Abnormal cases 92
3.5.3.2 Sending an RLC/MAC control message: single block packet downlink assignment procedure 92

4 Elementary procedures for Mobility Management 93

5 Elementary procedures for circuit-switched Call Control 93

6 Support for packet services 93

7 Examples of structured procedures 93

8 Handling of unknown, unforeseen, and erroneous protocol data 93
8.1 General 93
8.2 Message too short 94
8.3 Unknown or unforeseen transaction identifier 94
8.4 Unknown or unforeseen message type 94
8.5 Non-semantical mandatory information element errors 94
8.5.1 Radio resource management 95
8.6 Unknown and unforeseen IEs in the non-imperative message part 95
8.6.1 IEIs unknown in the message 95
8.6.2 Out of sequence IEs 95
8.6.3 Repeated IEs 95
8.7 Non-imperative message part errors 96
8.7.1 Syntactically incorrect optional IEs 96
8.7.2 Conditional IE errors 96
8.8 Messages with semantically incorrect contents 96
8.9 Incomplete rest octets 97

9 Message functional definitions and contents 97
9.1 Messages for Radio Resources management 98
9.1.1 Additional assignment 100
9.1.1.1 Mobile Allocation 100
9.1.1.2 Starting Time 100
9.1.2 Assignment command 100
9.1.2.1 Mode of the First Channel (Channel Set 1) and Mode of Channel Set "X" (2=<X=<8) 102
9.1.2.2 Description of the Second Channel 102
9.1.2.3 Mode of the Second Channel 102
9.1.2.4 Mobile Allocation and Frequency List, after the starting time 102
9.1.2.5 Starting Time 102
9.1.2.6 Reference cell frequency list 103
9.1.2.7 Cell Channel Description 103
9.1.2.8 Cipher Mode Setting 103
9.1.2.9 VGCS target mode Indication 103
9.1.2.10 Description of the multislot allocation 103
9.1.2.11 Multi Rate configuration 104
9.1.3 Assignment complete 104
9.1.4 Assignment failure 104
9.1.5 Channel mode modify 105

9.1.5.1 Channel Description 105
9.1.5.2 VGCS target mode Indication 105
9.1.5.3 Multi Rate configuration 105
9.1.6 Channel mode modify acknowledge 105
9.1.7 Channel release 106
9.1.7.1 Channel description and mobile allocation 106
9.1.7.2 Group Cipher Key Number 107
9.1.7.3 UTRAN Frequency List 107
9.1.8 Channel request 107
9.1.9 Ciphering mode command 109
9.1.10 Ciphering mode complete 109
9.1.10.1 Mobile Equipment Identity 109
9.1.11 Classmark change 110
9.1.11.1 Additional Mobile Station Classmark Information 110
9.1.11.2 Mobile Station Classmark 110
9.1.11a UTRAN Classmark Change 110
9.1.11b cdma2000 Classmark Change 111
9.1.11c (void) 112
9.1.12 Classmark enquiry 112
9.1.12a (void) 112
9.1.12b Configuration change command 112
9.1.12b.1 Description of the multislot allocation 113
9.1.12b.2 Mode of Channel Set "X" (1=<X<=8) 113
9.1.12c Configuration change acknowledge 113
9.1.12d Configuration change reject 114
9.1.12e DTM Assignment Command 115
9.1.12e.1 TBF starting time 115
9.1.12e.2 RR Packet Uplink Assignment and RR Packet Downlink Assignment IEs 115
9.1.12f DTM Assignment Failure 116
9.1.12g DTM Information 116
9.1.12h DTM Reject 116
9.1.12i DTM Request 117
9.1.13 Frequency redefinition 117
9.1.13.1 Cell Channel Description 118
9.1.13a PDCH Assignment command 118
9.1.13a.1 Mobile Allocation and Frequency List, after the starting time 119
9.1.13a.2 Starting Time 119
9.1.13a.3 Reference cell frequency list 120
9.1.13a.4 Cell Channel Description 120
9.1.13a.5 Packet Assignment 120
9.1.13b GPRS suspension request 120
9.1.14 Handover access 121
9.1.15 Handover command 121
9.1.15.1 Synchronization Indication 123
9.1.15.2 Mode of the First Channel (Channel Set 1) and Mode of Channel Set "X" (2=<X<=8) 123
9.1.15.3 Description of the Second Channel 123
9.1.15.4 Mode of the Second Channel 123
9.1.15.5 Frequency Channel Sequence, Frequency List, Frequency short list and Mobile Allocation, after time 123
9.1.15.6 Starting Time 124
9.1.15.7 Reference cell frequency list 124
9.1.15.8 Real Time Difference 124
9.1.15.9 Timing Advance 125
9.1.15.10 Cipher Mode Setting 125
9.1.15.11 VGCS target mode indication 125
9.1.15.12 Description of the multislot allocation 125
9.1.15.13 MultiRateconfiguration 125
9.1.15a Inter System To UTRAN Handover Command 126
9.1.15b Inter System To cdma2000 Handover Command 126
9.1.16 Handover complete 126
9.1.16.1 Mobile Observed Time Difference 127
9.1.17 Handover failure 127

9.1.18 Immediate assignment 127
9.1.18.0a Dedicated mode or TBF 128
9.1.18.0b Channel Description 128
9.1.18.0c Packet Channel Description 128
9.1.18.0d Request Reference 128
9.1.18.0e Timing Advance 129
9.1.18.1 Mobile Allocation 129
9.1.18.2 Starting Time 129
9.1.18.3 IA Rest Octets (Frequency parameters, before time) 129
9.1.18.4 IA Rest Octets (assignment of uplink or downlink TBF) 129
9.1.19 Immediate assignment extended 129
9.1.19.1 Unnecessary IEs 130
9.1.19.2 Mobile Allocation 130
9.1.19.3 Starting Time 130
9.1.19.4 Maximum message length 130
9.1.19.5 IAX Rest Octets 131
9.1.20 Immediate assignment reject 131
9.1.20.1 Use of the indexes 131
9.1.20.2 Filling of the message 131
9.1.20.2a Request Reference 132
9.1.20.3 Wait Indication 132
9.1.20.4 IAR Rest Octets 132
9.1.21 Measurement report 132
9.1.21a Notification/FACCH 132
9.1.21a.1 (void) 134
9.1.21a.2 (void) 134
9.1.21a.3 (void) 134
9.1.21a.4 (void) 134
9.1.21b Notification/NCH 134
9.1.21b.1 (void) 134
9.1.21b.2 (void) 134
9.1.21c (void) 134
9.1.21d Notification response 134
9.1.21e RR-Cell Change Order 135
9.1.21e.1 3G Target Cell 135
9.1.21f Packet Assignment 135
9.1.21f.1 RR Packet Uplink Assignment and RR Packet Downlink Assignment IEs 136
9.1.21g Packet Notification 136
9.1.22 Paging request type 1 136
9.1.22.1 Unnecessary IE 137
9.1.22.2 Channels needed for Mobiles 1 and 2 137
9.1.22.3 Mobile Identities 137
9.1.22.4 P1 Rest Octets 137
9.1.23 Paging request type 2 137
9.1.23.1 Channels needed for Mobiles 1 and 2 138
9.1.23.2 Mobile Identity 3 138
9.1.23.3 P2 Rest Octets 138
9.1.24 Paging request type 3 138
9.1.24.1 Channels needed for Mobiles 1 and 2 139
9.1.24.2 P3 Rest Octets 139
9.1.25 Paging response 139
9.1.25.1 Mobile Station Classmark 140
9.1.26 Partial release 140
9.1.26.1 Channel Description 140
9.1.27 Partial release complete 140
9.1.28 Physical information 141
9.1.28a RR Initialisation Request 141
9.1.29 RR Status 142
9.1.30a Synchronization channel information 142
9.1.30b COMPACT Synchronization channel information 143
9.1.31 System information Type 1 143
9.1.32 System information type 2 144

9.1.33 System information type 2bis 144
9.1.34 System information type 2ter 145
9.1.34a System information type 2quater 146
9.1.35 System information type 3 146
9.1.36 System information type 4 147
9.1.36.1 CBCH Channel description 148
9.1.36.2 CBCH Mobile Allocation 148
9.1.36.3 SI 4 Rest Octets 148
9.1.37 System information type 5 148
9.1.38 System information type 5bis 148
9.1.39 System information type 5ter 149
9.1.40 System information type 6 150
9.1.40.1 Cell Identity 150
9.1.40.2 Location Area Identification 150
9.1.40.3 Cell Options 150
9.1.40.4 NCC permitted 150
9.1.41 System information type 7 151
9.1.42 System information type 8 151
9.1.43 System information Type 9 152
9.1.43a System information Type 13 152
9.1.43b (void) 153
9.1.43c (void) 153
9.1.43d System information type 16 153
9.1.43e System information type 17 153
9.1.43f System information type 19 154
9.1.43g System information type 18 154
9.1.43h System information type 20 155
9.1.44 Talker indication 155
9.1.45 Uplink access 156
9.1.46 Uplink busy 156
9.1.47 Uplink free 157
9.1.48 Uplink release 157
9.1.49 VGCS uplink grant 158
9.1.50 System information type 10 $(ASCI)$ 158
9.1.51 EXTENDED MEASUREMENT ORDER 159
9.1.52 Extended measurement report 159
9.1.53 Application Information 160
9.1.54 MEASUREMENT INFORMATION 160
9.1.55 ENHANCED MEASUREMENT REPORT 168
9.2 Messages for mobility management 170
9.3 Messages for circuit-switched call control 170
9.4 GPRS Mobility Management Messages 170
9.5 GPRS Session Management Messages 170
9.6 GTTP Messages 170
9.6.1 GPRS Information 171
9.6.1.1 TLLI 171
9.6.1.2 LLC PDU Container 171

10 General message format and information elements coding 171
10.1 Overview 171
10.2 Protocol Discriminator 172
10.3 Skip indicator 172
10.3.1 Skip indicator 172
10.4 Message Type 173
10.5 Other information elements 174
10.5.1 Common information elements. 176
10.5.2 Radio Resource management information elements 176
10.5.2.1a BA Range 176
10.5.2.1b Cell Channel Description 177
10.5.2.1b.1 General description 178
10.5.2.1b.2 Bit map 0 format 179
10.5.2.1b.3 Range 1024 format 179

10.5.2.1b.4 Range 512 format 180
10.5.2.1b.5 Range 256 format 181
10.5.2.1b.6 Range 128 format 182
10.5.2.1b.7 Variable bit map format 183
10.5.2.1c BA List Pref 184
10.5.2.1d UTRAN Frequency List 184
10.5.2.2 Cell Description 185
10.5.2.3 Cell Options (BCCH) 185
10.5.2.3a Cell Options (SACCH) 185
10.5.2.4 Cell Selection Parameters 187
10.5.2.4a MAC Mode and Channel Coding Requested 189
10.5.2.5 Channel Description 189
10.5.2.5a Channel Description 2 191
10.5.2.6 Channel Mode 193
10.5.2.7 Channel Mode 2 194
10.5.2.7a UTRAN Classmark information element 195
10.5.2.7b (void) 195
10.5.2.7c Classmark Enquiry Mask 195
10.5.2.8 Channel Needed 196
10.5.2.8a Channel Request Description 196
10.5.2.8b Channel Request Description 2 198
10.5.2.9 Cipher Mode Setting 198
10.5.2.10 Cipher Response 199
10.5.2.11 Control Channel Description 199
10.5.2.11a DTM Information Rest Octets 201
10.5.2.12 Frequency Channel Sequence 202
10.5.2.13 Frequency List 202
10.5.2.13.1 General description 203
10.5.2.13.2 Bit map 0 format 203
10.5.2.13.3 Range 1024 format 204
10.5.2.13.4 Range 512 format 206
10.5.2.13.5 Range 256 format 208
10.5.2.13.6 Range 128 format 210
10.5.2.13.7 Variable bit map format 213
10.5.2.14 Frequency Short List 213
10.5.2.14a Frequency Short List 2 213
10.5.2.14b Group Channel Description 214
10.5.2.14c GPRS Resumption 216
10.5.2.14d GPRS broadcast information 216
10.5.2.15 Handover Reference 217
10.5.2.16 IA Rest Octets 217
10.5.2.17 IAR Rest Octets 223
10.5.2.18 IAX Rest Octets 223
10.5.2.19 L2 Pseudo Length 224
10.5.2.20 Measurement Results 224
10.5.2.20a GPRS Measurement Results 227
10.5.2.21 Mobile Allocation 228
10.5.2.21a Mobile Time Difference 229
10.5.2.21aa MultiRate configuration 229
10.5.2.21b Multislot Allocation 232
10.5.2.21c NC mode 234
10.5.2.22 Neighbour Cell Description 234
10.5.2.22a Neighbour Cell Description 2 235
10.5.2.22b (void) 236
10.5.2.22c NT/N Rest Octets 236
10.5.2.23 P1 Rest Octets 236
10.5.2.24 P2 Rest Octets 238
10.5.2.25 P3 Rest Octets 239
10.5.2.25a Packet Channel Description 239
10.5.2.25b Dedicated mode or TBF 241
10.5.2.25c RR Packet Uplink Assignment 241
10.5.2.25d RR Packet Downlink Assignment 245

10.5.2.26 Page Mode 247
10.5.2.26a (void) 248
10.5.2.26b (void) 248
10.5.2.26c (void) 248
10.5.2.26d (void) 248
10.5.2.27 NCC Permitted 248
10.5.2.28 Power Command 248
10.5.2.28a Power Command and access type 249
10.5.2.29 RACH Control Parameters 250
10.5.2.30 Request Reference 251
10.5.2.31 RR Cause 252
10.5.2.32 SI 1 Rest Octets 253
10.5.2.33 SI 2bis Rest Octets 254
10.5.2.33a SI 2ter Rest Octets 255
10.5.2.33b SI 2quater Rest Octets 257
10.5.2.34 SI 3 Rest Octets 261
10.5.2.35 SI 4 Rest Octets 264
10.5.2.35a SI 6 Rest Octets 267
10.5.2.36 SI 7 Rest Octets 269
10.5.2.37 SI 8 Rest Octets 269
10.5.2.37a SI 9 Rest Octets 269
10.5.2.37b SI 13 Rest Octets 271
10.5.2.37c (void) 274
10.5.2.37d (void) 274
10.5.2.37e SI 16 Rest Octets 274
10.5.2.37f SI 17 Rest Octets 275
10.5.2.37g SI 19 Rest Octets 276
10.5.2.37h SI 18 Rest Octets 278
10.5.2.37i SI 20 Rest Octets 280
10.5.2.38 Starting Time 280
10.5.2.39 Synchronization Indication 281
10.5.2.40 Timing Advance 282
10.5.2.41 Time Difference 282
10.5.2.41a TLLI 283
10.5.2.42 TMSI/P-TMSI 283
10.5.2.42a VGCS target mode Indication 284
10.5.2.43 Wait Indication 284
10.5.2.44 SI10 rest octets $(ASCI)$ 285
10.5.2.45 EXTENDED MEASUREMENT RESULTS 287
10.5.2.46 Extended Measurement Frequency List 289
10.5.2.47 Suspension Cause 289
10.5.2.48 APDU ID 290
10.5.2.49 APDU Flags 290
10.5.2.50 APDU Data 291
10.5.2.51 Handover To UTRAN Command 291
10.5.2.52 Handover To cdma2000 Command 292
10.5.2.53 (void) 292
10.5.2.54 (void) 292
10.5.2.55 (void) 292
10.5.2.56 3G Target Cell 292
10.5.3 Mobility management information elements. 293
10.5.4 Call control information elements. 293
10.5.5 GPRS mobility management information elements 293
10.5.6 Session management information elements 293
10.5.7 GPRS Common information elements 293
10.5.8 GTTP information elements. 293
10.5.8.1 LLC PDU Container 293

11 List of system parameters 294
11.1 Timers and counters for radio resource management 294
11.1.1 Timers on the mobile station side 294
11.1.2 Timers on the network side 296

11.1.3 Other parameters 298
11.2 Timers of mobility management 298
11.3 Timers of circuit-switched call control 298

Annex A (informative): Example of subaddress information element coding 299

Annex B (normative): Compatibility checking 300

Annex C (normative): Low layer information coding principles 301

Annex D (informative): Examples of bearer capability information element coding 302

Annex E (informative): Comparison between call control procedures specified in 3GPP TS 24.008 and CCITT Recommendation Q.931 303

Annex F (informative): GSM specific cause values for radio resource management 304

Annex G (informative): GSM specific cause values for mobility management 306

Annex H (informative): GSM specific cause values for call control 307

Annex I (informative): GSM specific cause values for session management 308

Annex J (informative): Algorithm to encode frequency list information elements 309
J.1 Introduction 309
J.2 General principle 309
J.3 Performances 311
J.4 Encoding algorithm 312
J.5 Decoding 314
J.6 A detailed example 315

Annex K (informative): Default Codings of Information Elements 317
K.1 Common information elements 317
K.2 Radio Resource management information elements 317

Annex L (normative): Additional Requirements for backward compatibility with PCS 1900 for NA revision 0 ME 318

Annex M (informative): Change history 319

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the procedures used at the radio interface (Reference Point Um, see 3GPP TS 04.02) for Radio Resource (RR) management.

Notation "Reserved clause number" is used to indicate which clauses of the specification were moved from this part of the standard to the other part when this standard was split between RAN and CN parts.

When the notations for "further study" or "FS" or "FFS" are present in this specification they mean that the indicated text is not a normative portion of this standard.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in 3GPP TS 04.03.

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in 3GPP TS 24.007.

1.1 Scope of the Technical Specification

The procedures currently described in the present document are for radio resource management for circuit-switched and GPRS services.

3GPP TS 24.010 contains functional procedures for support of supplementary services.

3GPP TS 04.11 contains functional procedures for support of point-to-point short message services.

3GPP TS 04.12 contains functional description of short message - cell broadcast.

3GPP TS 04.60 contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

3GPP TS 24.071 contains functional descriptions and procedures for support of location services.

3GPP TS 24.008 contains the procedures for CN protocols.

NOTE: "layer 3" includes the functions and protocols described in this Technical Specification. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

1.2 Application to the interface structures

The layer 3 procedures apply to the interface structures defined in 3GPP TS 04.03. They use the functions and services provided by layer 2 defined in 3GPP TS 04.05 and 3GPP TS 04.06. 3GPP TS 24.007 gives the general description of layer 3 including procedures, messages format and error handling.

1.3 Structure of layer 3 procedures

A building block method is used to describe the layer 3 procedures.

The basic building blocks are "elementary procedures" provided by the protocol control entities of the three sublayers, i.e. radio resource management, mobility management and connection management sublayer.

Complete layer 3 transactions consist of specific sequences of elementary procedures. The term "structured procedure" is used for these sequences.

1.4 Test procedures

Test procedures of the GSM radio interface signalling are described in 3GPP TS 11.10 and 3GPP TS 11.2x series.

1.5 Use of logical channels

The logical control channels are defined in 3GPP TS 05.02. In the following those control channels are considered which carry signalling information or specific types of user packet information:

i) Broadcast Control CHannel (BCCH): downlink only, used to broadcast Cell specific information;

ii) Synchronization CHannel (SCH): downlink only, used to broadcast synchronization and BSS identification information;

iii) Paging CHannel (PCH): downlink only, used to send page requests to Mobile Stations (MSs);

iv) Random Access CHannel (RACH): uplink only, used to request a Dedicated Control CHannel;

v) Access Grant CHannel (AGCH): downlink only, used to allocate a Dedicated Control CHannel;

vi) Standalone Dedicated Control CHannel (SDCCH): bi-directional;

vii) Fast Associated Control CHannel (FACCH): bi-directional, associated with a Traffic CHannel;

viii) Slow Associated Control CHannel (SACCH): bi-directional, associated with a SDCCH or a Traffic CHannel;

ix) Cell Broadcast CHannel (CBCH): downlink only used for general (not point to point) short message information;

x) Notification CHannel (NCH): downlink only, used to notify mobile stations of VBS (Voice Broadcast Service) calls or VGCS (Voice Group Call Service) calls.

Two service access points are defined on signalling layer 2 which are discriminated by their Service Access Point Identifiers (SAPI) (see 3GPP TS 04.06):

i) SAPI 0: supports the transfer of signalling information including user-user information;

ii) SAPI 3: supports the transfer of user short messages.

Layer 3 selects the service access point, the logical control channel and the mode of operation of layer 2 (acknowledged, unacknowledged or random access, see 3GPP TS 04.05 and 3GPP TS 04.06) as required for each individual message.

1.6 Overview of control procedures

1.6.1 List of procedures

The following procedures are specified in this Technical Specification:

a) Clause 3 specifies elementary procedures for Radio Resource management:

- system information broadcasting (clause 3.2.2)
- RR connection establishment (clause 3.3)
  - entering the dedicated mode : immediate assignment procedure (clause 3.3.1.1)
  - paging procedure for RR connection establishment (clause 3.3.2)
  - notification procedure (clause 3.3.3)
- Procedures in dedicated mode and in group transmit mode (clause 3.4)
  - measurement report procedure (clause 3.4.1.2)
  - intracell change of channels (clause 3.4.3)
  - intercell change of channels (clause 3.4.4)

  - frequency redefinition procedure (clause 3.4.5)
  - channel mode change procedure (clause 3.4.6)
  - ciphering mode setting procedure (clause 3.4.7)
  - additional channel assignment procedure (clause 3.4.8)
  - partial channel release procedure (clause 3.4.9)
- radio resources connection release (clause 3.4.13)
- specific RR procedures for voice broadcast channels and voice group call channels (clause 3.4.15)
- application procedures (clause 3.4.21)
- RR procedures on CCCH related to temporary block flow establishment (clause 3.5)
  - packet paging procedure using CCCH (clause 3.5.1)
  - packet access procedure using CCCH (clause 3.5.2)
- packet downlink assignment procedure using CCCH (clause 3.5.3)
- RR procedures on DCCH related to temporary block flow establishment
  - Assignment to Packet Data Channel procedure (clause 3.4.19)
  - Network controlled cell reselection (clause 3.4.20)

Clause 8 specifies actions to be taken on various error conditions and also provides rules to ensure compatibility with future enhancements of the protocol.

1.7 Applicability of implementations

The applicability of procedures of this technical specification for the mobile station is dependent on the services and functions which are to be supported by a mobile station. For the MS, the Revision level indicating Release '99 is linked to the full support of the RR protocol and procedures in 3GPP TS 04.18 Release '99.

1.7.1 Voice Group Call Service (VGCS) and Voice Broadcast Service (VBS)

For mobile stations supporting the Voice Group Call Service or the Voice Broadcast Service, it is explicitly mentioned throughout this technical specification if a certain procedure is applicable only for such a service and, if necessary, how mobile stations not supporting such a service shall behave.

For VGCS and VBS, the following possible mobile station implementations exist:

- support of listening to voice broadcast calls (VBS listening)
- support of originating a voice broadcast call (VBS originating)
- support of listening to voice group calls (VGCS listening)
- support of talking in voice group calls (VGCS talking. This always includes the implementation for VGCS listening)
- support of originating a voice group call (VGCS originating. This always includes the implementation for VGCS talking)

Apart from the explicitly mentioned combinations, all possible combinations are optional and supported by this technical specification.

The related terms are used in this technical specification, if information on these implementation options is required.

1.7.2 General Packet Radio Service (GPRS)

For mobile stations supporting the General Packet Radio Service (GPRS), it is explicitly mentioned throughout the technical specification if a certain procedure is applicable only for such a service and, if necessary, how mobile stations not supporting such a service shall behave.

A GPRS MS may operate in one of the following MS operation modes, see 3GPP TS 23.060 [74]:

- MS operation mode A;
- MS operation mode B; or
- MS operation mode C.

The MS operation mode depends on the services that the MS is attached to, i.e., only GPRS or both GPRS and non-GPRS services, and upon the MS's capabilities to operate GPRS and other GSM services simultaneously. Mobile stations that are capable to operate GPRS services are referred to as GPRS MSs.

NOTE: Other GSM technical specifications may refer to the MS operation modes A, B, and C as GPRS class-A MS, GPRS class-B MS, and GPRS class-C MS.

It should be noted that it is possible that for a GPRS MS, the GMM procedures currently described in the present document do not support combinations of VGCS, VBS and GPRS. The possible interactions are not studied yet.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] (void)

[2] 3GPP TS 01.04: "Abbreviations and acronyms".

[3] (void)

[4] (void)

[5] (void)

[6] 3GPP TS 22.011: "Service accessibility".

[7] (void)

[8] (void)

[9] (void)

[10] 3GPP TS 23.003: "Numbering, addressing and identification".

[11] 3GPP TS 03.13: "Discontinuous Reception (DRX) in the GSM system".

[12] (void)

[12a] 3GPP TS 23.071: "Location Services; Functional description – Stage 2".

[13] (void)

[14] 3GPP TS 23.022: "Functions related to Mobile Station (MS) in idle mode".

[15] 3GPP TS 04.02: "GSM Public Land Mobile Network (PLMN) access reference configuration".

[16] 3GPP TS 04.03: "Mobile Station - Base Station System (MS - BSS) interface Channel structures and access capabilities".

[17] 3GPP TS 04.04: "Layer 1 General requirements".

[18] 3GPP TS 04.05: "Data Link (DL) layer General aspects".

[19] 3GPP TS 04.06: "Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[20] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[21] 3GPP TS 24.010: "Mobile radio interface layer 3 Supplementary services specification; General aspects".

[22] 3GPP TS 04.11: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[23] 3GPP TS 04.12: "Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface".

[23a] 3GPP TS 24.071: "Mobile radio interface layer 3 location services specification.

[23b] 3GPP TS 04.31 "Location Services;Mobile Station (MS) – Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP)".

[[24] 3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification Formats and coding".

[25] (void)

[26] (void)

[27] (void)

[28] (void)

[29] (void)

[30] (void)

[31] (void)

[32] 3GPP TS 05.02: "Multiplexing and multiple access on the radio path".

[33] 3GPP TS 05.05: "Radio transmission and reception".

[34] 3GPP TS 05.08: "Radio subsystem link control".

[35] 3GPP TS 05.10: "Radio subsystem synchronization".

[36] (void)

[37] (void)

[38] (void)

[39] 3GPP TS 11.10: "Mobile Station (MS) conformity specification".

[40] (void)

[41] (void)

[42] (void)

[43] (void)

[44] (void)

[45] (void)

[46] (void)

[47] (void)

[48] (void)

[49] (void)

[50] (void)

[51] (void)

[52] (void)

[53] ITU-T Recommendation Q.931: ISDN user-network interface layer 3 specification for basic control".

[54] (void)

[55] (void)

[56] (void)

[57] (void)

[58] (void)

[59] (void)

[60] (void)

[61] (void)

[62] (void)

[63] (void)

[64] (void)

[65] (void)

[66] (void)

[67] (void)

[68] (void)

[69] (void)

[70] (void)

[71] (void)

[72] (void)

[73] (void)

[74] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[75] (void)

[76] 3GPP TS 04.60: "General Packet Radio Service (GPRS); Mobile Station - Base Station System (MS-BSS) interface; Radio Link Control and Medium Access Control (RLC/MAC) layer specification".

[77] (void)

[78] (void)

[79] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols - Stage 3".

[80] TIA/EIA/IS-2000-5-A: "Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems".

[81] TIA/EIA/IS-833: "Multi-Carrier Specification for Spread Spectrum Systems on GSM MAP (MC-MAP) (Lower Layers Air Interface)".

[82] TIA/EIA/IS-2000-4-A: "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems".

2.1 Definitions and abbreviations

Abbreviations used in this specification are listed in 3GPP TS 01.04.

2.1.1 Random values

In a number of places in this Technical Specification, it is mentioned that some value must take a "random" value, in a given range, or more generally with some statistical distribution. Such cases interest only the Mobile Station.

It is required that there is a low probability that two MSs in the same conditions (including the case of two MSs of the same type from the same manufacturer) will choose the same value. Moreover, it is required that, if it happens that two MSs in similar conditions choose the same value, the probability of their choices being identical at the next occasion is the same as if their first choices had been different.

The meaning of such a specification is that any statistical test for these values, done on a series of similar events, will obtain a result statistically compatible with the specified distribution. This shall hold even in the cases where the tests are conducted with a subset of possible events, with some common parameters. Moreover, basic tests of independence of the values within the series shall pass.

Data against which correlation with the values shall not be found are the protocol state, or the IMSI, or identities or other unrelated information broadcast by the network, or the current TDMA frame number.

2.1.2 Vocabulary

The following terms are used in this Technical Specification:

- **idle mode:** In this mode, the mobile station is not allocated any dedicated channel; it listens to the CCCH and the BCCH.
- **group receive mode:** (only applicable for mobile stations supporting VGCS listening or VBS listening) In this mode, the mobile station is not allocated a dedicated channel with the network; it listens to the downlink of a voice broadcast channel or voice group call channel allocated to the cell. Occasionally, the mobile station has to listen to the BCCH of the serving cell as defined in 3GPP TS 23.022 and 3GPP TS 05.08.
- **dedicated mode:** In this mode, the mobile station is allocated at least two dedicated channels, only one of them being a SACCH.
- **group transmit mode:** (only applicable for mobile stations supporting VGCS talking) In this mode, one mobile station of a voice group call is allocated two dedicated channels, one of them being a SACCH. These channels can be allocated to one mobile station at a time but to different mobile stations during the voice group call.

- **packet idle mode**: (only applicable for mobile stations supporting GPRS) In this mode, mobile station is not allocated any radio resource on a packet data physical channel; it listens to the PBCCH and PCCCH or, if those are not provided by the network, to the BCCH and the CCCH, see 3GPP TS 04.60.

- **packet transfer mode**: (only applicable for mobile stations supporting GPRS) In this mode, the mobile station is allocated radio resource on one or more packet data physical channels for the transfer of LLC PDUs.

- **dual transfer mode**: (only applicable for mobile stations supporting GPRS and DTM) In this mode, the mobile station is allocated radio resources providing an RR connection and a Temporary Block Flow (3GPP TS 04.60) on one or more physical channels. The allocation of radio resource for the RR connection and the Temporary Block Flow is co-ordinated by the network to comply with the capabilities of the mobile station in dual transfer mode.

- **main DCCH:** In Dedicated mode and group transmit mode, only two channels are used as DCCH, one being a SACCH, the other being a SDCCH or a FACCH; the SDCCH or FACCH is called here "the main DCCH".

- A channel is **activated** if it can be used for transmission, in particular for signalling, at least with UI frames. On the SACCH, whenever activated, it must be ensured that a contiguous stream of layer 2 frames is sent.

- A TCH is **connected** if circuit mode user data can be transferred. A TCH cannot be connected if it is not activated. A TCH which is activated but not connected is used only for signalling, i.e. as a DCCH.

- The data link of SAPI 0 on the main DCCH is called the **main signalling link**. Any message specified to be sent on the main signalling link is sent in acknowledged mode except when otherwise specified.

- The term **"to establish"** a link is a short form for **"to establish the multiframe mode"** on that data link. It is possible to send UI frames on a data link even if it is not established as soon as the corresponding channel is activated. Except when otherwise indicated, a data link layer establishment is done without an information field.

- **"channel set"** is used to identify TCHs that carry related user information flows, e.g., in a multislot configuration used to support circuit switched connection(s), which therefore need to be handled together.

- A **temporary block flow** (TBF) is a physical connection used by the two RR peer entities to support the uni-directional transfer of LLC PDUs on packet data physical channels, see 3GPP TS 04.60.

- **RLC/MAC block:** A RLC/MAC block is the protocol data unit exchanged between RLC/MAC entities, see 3GPP TS 04.60.

- A **GMM context** is established when a GPRS attach procedure is successfully completed.

- **Network operation mode**

  The three different network operation modes I, II, and III are defined in 3GPP TS 23.060.

  The network operation mode shall be indicated as system information. For proper operation, the network operation mode should be the same in each cell of one routing area.

- **GPRS MS operation mode**

  The three different GPRS MS operation modes A, B, and C are defined in 3GPP TS 23.060.

3 Radio Resource management procedures

3.1 Overview/General

3.1.1 General

Radio Resource management procedures include the functions related to the management of the common transmission resources, e.g. the physical channels and the data link connections on control channels.

The general purpose of Radio Resource procedures is to establish, maintain and release RR connections that allow a point-to-point dialogue between the network and a mobile station. This includes the cell selection/reselection and the handover procedures. Moreover, Radio Resource management procedures include the reception of the uni-directional BCCH and CCCH when no RR connection is established. This permits automatic cell selection/reselection.

If VGCS listening or VBS listening are supported, the radio resource management also includes the functions for the reception of the voice group call channel or the voice broadcast channel, respectively, and the automatic cell reselection of the mobile station in Group receive mode.

If VGCS talking is supported, the radio resource management also includes the functions for the seizure and release of the voice group call channel.

If GPRS point-to-point services are supported, the radio resource management procedures includes functions related to the management of transmission resources on packet data physical channels. This includes the broadcast of system information to support a mobile station in packet idle and packet transfer modes, see also 3GPP TS 04.60.

NOTE 1: This chapter includes some procedures used for multislot operation and for the TCH/H + TCH/H configuration which need not be supported by simple mobile stations.

NOTE 2: The procedures and the information content relating to the TCH/H + TCH/H configuration in RR messages is for further study.

3.1.2 Services provided to upper layers

A RR connection is a physical connection used by the two peer entities to support the upper layers' exchange of information flows.

3.1.2.1 Idle mode

In idle mode no RR connection exists.

The RR procedures include (on the mobile station side) those for automatic cell selection/reselection. The RR entity indicates to upper layers the unavailability of a BCCH/CCCH and the cell change when decided by the RR entity. Upper layers are advised of the BCCH broadcast information when a new cell has been selected, or when a relevant part of this information changes.

For cell-reselection the BA (list), together with the 3G Cell Reselection list for a multi-RAT MS, shall be used.

In Idle mode, upper layers can require the establishment of an RR connection.

3.1.2.2 Dedicated mode

In dedicated mode, the RR connection is a physical point-to-point bi-directional connection, and includes a SAPI 0 data link connection operating in multiframe mode on the main DCCH. If dedicated mode is established, RR procedures provide the following services:

- establishment/release of multiframe mode on data link layer connections other than SAPI 0, on the main DCCH or on the SACCH associated with the channel carrying the main signalling link;
- transfer of messages on any data link layer connection;

- indication of temporary unavailability of transmission (suspension, resuming);
- indication of loss of RR connection;
- automatic cell reselection and handover to maintain the RR connection;
- setting/change of the transmission mode on the physical channels, including change of type of channel, change of the coding/decoding/transcoding mode and setting of ciphering;
- allocation/release of an additional channel (for the TCH/H + TCH/H configuration);
- allocation/release of additional channels for multislot operation;
- release of an RR connection.

3.1.2.3 Group receive mode

Only applicable for mobile stations supporting VGCS listening or VBS listening.

In this mode, the RR procedures on the mobile station side provide the services:

- local connection to the voice broadcast channel or voice group call channel;
- reception of messages in unacknowledged mode;
- automatic cell reselection for the mobile station in Group receive mode;
- local disconnection from the received voice group call or broadcast call channels.

For mobile stations supporting both VGCS listening and VGCS transmit, in addition, the RR procedures on the mobile station side provide the service:

- uplink access procedures to establish the RR connection.

3.1.2.4 Group transmit mode

Only applicable for mobile stations supporting VGCS talking.

In group transmit mode, the RR connection is a physical point-to-point bi-directional connection, and includes a SAPI 0 data link connection operating in multiframe mode on the main DCCH. If the group transmit mode is established, RR procedures provide the following services:

- transfer of messages on the SAPI 0 of the data link layer connection;
- indication of loss of RR connection;
- automatic cell reselection and handover to maintain the RR connection;
- setting of the transmission mode on the physical channels, change of type of channel and setting of ciphering;
- release of the RR connection.

3.1.2.5 Packet idle mode

Only applicable for mobile stations supporting GPRS.

In packet idle mode, no temporary block flow exists (see 3GPP TS 04.60). Upper layers may require the transfer of a LLC PDU, which implicitly triggers the establishment of a temporary block flow.

3.1.2.6 Packet transfer mode

Only applicable for mobile stations supporting GPRS.

In packet transfer mode, the mobile station is allocated radio resource providing a temporary block flow on one or more packet data physical channels. The RR sublayer provides the following services, see also 3GPP TS 04.60:

- transfer of LLC PDUs in acknowledged mode;
- transfer of LLC PDUs in unacknowledged mode.

Depending on the GPRS mode of operation (class A or B), the mobile station may leave both packet idle mode and packet transfer mode before entering dedicated mode, group receive mode or group transmit mode.

Cell reselection in packet idle and packet transfer modes is specified in 3GPP TS 05.08. The RR entity on the mobile station side indicates to the upper layers the availability of a cell and a cell change when decided by the RR sublayer. Upper layers are advised of system information broadcast in the cell when a new cell has been selected, or when a relevant part of this information changes.

3.1.2.7 Dual transfer mode (DTM)

In dual transfer mode, the mobile station is simultaneously in dedicated mode and in packet transfer mode.This feature is optional for the mobile station and the network. It is only applicable for a mobile station supporting GPRS or EGPRS. Dual transfer mode is a subset of class A mode of operation, only possible if there is radio resource allocation co-ordination in the network.

3.1.3 Services required from data link and physical layers

The RR sublayer uses the services provided by the data link layer as defined in 3GPP TS 04.05.

Moreover, the RR sublayer directly uses services provided by the physical layer such as BCCH searching and transfer of RLC/MAC blocks, as defined in 3GPP TS 04.04.

3.1.4 Change of dedicated channels

3.1.4.1 Change of dedicated channels using SAPI = 0

In case a change of dedicated channels is required using a dedicated assignment and handover procedure, respectively, the RR sublayer will request the data link layer to suspend multiple frame operation before the mobile station leaves the old channel. When the channel change has been completed, layer 3 will request the data link layer to resume multiple frame operation again. The layer 2 suspend/resume procedures are described in 3GPP TS 04.05 and 04.06.

These procedures are specified in such a way that a loss of a layer 3 message cannot occur on the radio interface. However, messages sent from the mobile station to the network may be duplicated by the data link layer if a message has been transmitted but not yet completely acknowledged before the mobile station leaves the old channel (see 3GPP TS 04.06).

As the RR sublayer is controlling the channel change, a duplication of RR messages does not occur. However, there are some procedures for which a duplication is possible, e.g. DTMF procedures. For all upper layer procedures using the transport service of the GSM RR sub-layer (e.g., MM and CM procedures but not GMM or Session Management procedures), the request messages sent by the mobile station contain a sequence number in order to allow the network to detect duplicated messages, which are then ignored by the network. The same sequence number is used to protect against message duplication caused by channel changes between GSM and UTRAN and also by other UTRAN procedures (e.g. hard handover). The procedures for sequenced transmission on layer 3 are described in clause 3.1.4.2.

3.1.4.2 Change of dedicated channels using other SAPIs than 0

For SAPIs other than 0, the data link procedures described in 3GPP TS 04.06 do not provide any guarantee against message loss or duplication.

Therefore, if an application uses a SAPI other than 0 and if this application is sensitive to message loss or duplication, then it has to define its own protection mechanism. No general protection mechanism is provided by the protocol defined in this Technical Specification.

3.1.5 Procedure for Service Request and Contention Resolution

Upon seizure of the assigned dedicated channel, the mobile station establishes the main signalling link on this channel by sending a layer 2 SABM frame containing a layer 3 service request message. The data link layer will store this message to perform the contention resolution. The service request message will be returned by the network in the UA frame.

The data link layer in the mobile station compares the content of the information field (i.e. the layer 3 service request message) received in the UA frame with the stored message and leaves the channel in case they do not match. This procedure resolves contentions in the case where several mobile stations have accessed at the same random access slot and with the same random reference and one has succeeded due to capture. The full description of the procedure is given in 3GPP TS 04.06.

The purpose of the service request message is to indicate to the network which service the mobile station is requesting. This then allows the network to decide how to proceed (e.g. to authenticate or not).

The service request message must contain the identity of the mobile station and may include further information which can be sent without encryption.

The layer 3 service request message is typically one of the following:

- CM SERVICE REQUEST
- LOCATION UPDATING REQUEST
- IMSI DETACH
- PAGING RESPONSE
- CM RE-ESTABLISHMENT REQUEST
- NOTIFICATION RESPONSE
- IMMEDIATE SETUP
- RR INITIALISATION REQUEST

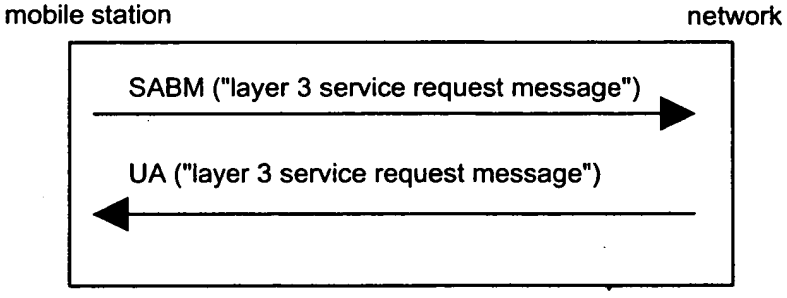

Figure 3.1.5.1/3GPP TS 04.18: Service request and contention resolution

3.1.6 Preemption

The datalink layer provides the capability to assign a priority to any message transferred in dedicated mode on SAPI 0 with multiframe operation. The available message priorities defined in 3GPP TS 04.06 are "high", "normal" and "low".

Messages assigned a "high" priority are enabled to preempt, in the data link layer, all preceeding untransmitted and partially transmitted messages assigned a "low" priority that are using the same data link connection (same SAPI and logical channel). Messages or message portions that are preempted are discarded without notification to higher layers except that the first 2*N201 octets of any partially transmitted message are not discarded. The following priority assignments are defined for those Radio Resource, Mobility Management and Connection Management messages that use SAPI 0.

Table 3.1.6.1/3GPP TS 04.18: Priority Values of Layer 3 Messages

Priority	Messages
Low	RR Application Information message
Normal	All MM messages All CM messages All GTTP messages All other RR messages using SAPI 0 not listed here
High	RR Channel Establishment: ADDITIONAL ASSIGNMENT RR Configuration Change: CONFIGURATION CHANGE COMMAND RR HANDOVER RELATED ASSIGNMENT COMMAND HANDOVER COMMAND RR-CELL CHANGE ORDER RR Channel release CHANNEL RELEASE PARTIAL RELEASE

Use of the preemption capability by layer 3 is not required in a BSS or MS that does not send any "low" priority message. In this case, all messages may be treated as having "normal" priority.

Preemption capabilities in Layer 3 is not applicable to the Uplink messages, hence all Uplink messages are treated as having "normal" priority. Note that the "Suspension and Resumption of Multiple frame operation" (See 3GPP TS 04.06) will affect the order in which the layer 3 messages are delivered on the Uplink.

3.2 Idle mode procedures and general procedures in packet idle and packet transfer modes

3.2.1 Mobile Station side

In idle mode, the MS listens to the BCCH and to the paging sub-channel for the paging group the MS belongs to in idle mode (cf. 3GPP TS 03.13); it measures the radio propagation for connection with other cells.

In packet idle and packet transfer modes (applicable only to a GPRS mobile station), the mobile station listens to either the PBCCH, if that is present in the cell, or BCCH. The requirements for the monitoring of system information is further specified in 3GPP TS 04.60. Moreover, the mobile station measures the radio propagation for connection with other cells.

In packet idle mode (applicable only to a GPRS mobile station), the mobile station listens to the paging sub-channels on the PCCCH or CCCH. Paging sub-channels are monitored according to the paging group determined for the mobile station and its current discontinuous reception (DRX) mode. The determination of paging group for the mobile station is defined in 3GPP TS 05.02. The DRX procedures are defined in 3GPP TS 04.60 and 3GPP TS 05.02.

A UTRAN capable mobile station in idle mode or packet idle mode attempts to read predefined configuration information from UTRAN Channels, as specified in 3GPP TS 05.08. This is only applicable to a mobile station supporting circuit-switched services.

Measurements are treated to assess the need of a cell change as specified in 3GPP TS 05.08. When the decision to change cells is made, the mobile station switches to the BCCH or PBCCH of the new cell. The broadcast information is then checked to verify the allowance to camp on this cell (cf. clause 3.2.2). Dependent on the mobile station type and configuration, the mobile station may be required to try to read further BCCH and PBCCH information. If allowed, the cell change is confirmed, and the broadcast information is then treated for Mobility Management actions (cf. clause 4). Similarly, physical contexts are updated (list of neighbouring cells frequencies, thresholds for some actions, etc. (cf. 3GPP TS 05.08 and clause 3.2.2)).

3.2.2 Network side

3.2.2.1 System information broadcasting

SYSTEM INFORMATION TYPE 2 to 4 messages, and optionally TYPE 1, 2bis, 2ter, 7, 8, 13, 16 and 17 and further types are regularly broadcast by the network on the BCCH. Based on this information the mobile station is able to decide whether and how it may gain access to the system via the current cell. The SYSTEM INFORMATION TYPE 2bis message shall be sent if and only if the EXT-IND bit in the Neighbour Cell Description IE in both the TYPE 2 and TYPE 2bis messages indicates that each IE only carries part of the BA. SYSTEM INFORMATION TYPE 2ter message shall be sent if and only if this is indicated in SYSTEM INFORMATION TYPE 3 message.

A GSM 900 mobile station which only supports the primary GSM band P-GSM 900 (cf. 3GPP TS 05.05) may consider the EXT-IND bit in the Neighbour Cell Description IE in the SYSTEM INFORMATION TYPE 2 message as a spare bit. If it does so it shall assume that the information element carries the complete BA and it shall ignore any SYSTEM INFORMATION TYPE 2bis and 2ter messages.

SYSTEM INFORMATION TYPE 2quater messages may be sent to provide further information for Enhanced Measurement Report. It may also include UTRAN information for cell reselection, measurement and reporting. A mobile station with no UTRAN capability should ignore 3G related information in this message. SYSTEM INFORMATION TYPE 2quater message shall be sent if and only if this is indicated in SYSTEM INFORMATION TYPE 3 message.

SI2 ter Rest Octet information element in the SI2 ter message may provide information on UTRAN Cells and 3G Measurement Parameters. Information received in this message is only used for cell reselection in idle mode.

When the SI2ter_MP_CHANGE_MARK parameter is changed in this information element, the MS shall re-read 3G Measurement parameters in all instances of SI2ter (by using SI2ter_INDEX and SI2ter_COUNT). When the SI2ter_3G_CHANGE_MARK is changed in this information element, the MS shall re-read UTRAN FDD Description and UTRAN TDD Description in all instances of SI2ter (by using SI2ter_INDEX and SI2ter_COUNT).

If the additional cell reselection parameters are broadcast then SYSTEM INFORMATION TYPE 3 message shall always contain these parameters. In addition to SYSTEM INFORMATION TYPE 3 at least either SYSTEM INFORMATION TYPE 4 or SYSTEM INFORMATION TYPE 7 and 8 messages shall contain these parameters too. SYSTEM INFORMATION TYPE 7 and 8 messages shall be sent if and only if this is indicated in SYSTEM INFORMATION TYPE 4 message.

If additional SoLSA specific parameters are broadcast then SYSTEM INFORMATION TYPE 16 and 17 messages, shall always contain these parameters. In addition to SYSTEM INFORMATION TYPE 16 and 17 messages at least either SYSTEM INFORMATION TYPE 4 or SYSTEM INFORMATION TYPE 7 and 8 messages shall contain these SoLSA specific parameters too. SYSTEM INFORMATION TYPE 16 and 17 messages shall be sent if and only if this is indicated in SYSTEM INFORMATION TYPE 3 message. The SoLSA information of any SYSTEM INFORMATION message shall be the same.

The SYSTEM INFORMATION TYPE 18 and 20 messages are sent when non-GSM broadcast information must be transmitted. The scheduling and repetition rate of these messages is determined by the system operator and is indicated in SYSTEM INFORMATION TYPE 9 message. Mobile stations without non-GSM capabilities defined for SI 18 and SI 20 should ignore these messages. An MS with non-GSM capabilities shall decode and identify information related to the respective Non-GSM protocol by reading the Non-GSM Protocol Discriminator field.

SYSTEM INFORMATION TYPE 19 messages shall be provided if COMPACT neighbour cells exist (see 3GPP TS 05.08). The presence of SI 19 messages shall be indicated in SI 9 message.

The support of GPRS shall be indicated in SYSTEM INFORMATION TYPE 3 message. In addition, the support of GPRS shall be indicated in either SYSTEM INFORMATION TYPE 4 or SYSTEM INFORMATION TYPE 7 and 8 messages. If GPRS is supported, SYSTEM INFORMATION TYPE 13 message shall be sent. SI 13 message shall not

be sent if GPRS is not supported. Additional requirements for the broadcast of system information in a cell supporting GPRS are specified in 3GPP TS 04.60.

NOTE 1: The allowed scheduling of SYSTEM INFORMATION messages on the BCCH are specified in 3GPP TS 05.02.

NOTE 2: The network should take into account limitations of certain mobile stations to understand SYSTEM INFORMATION TYPE 2bis, TYPE 2ter, the EXT-IND bit in the Neighbour Cell Description, the indication of 2ter in SYSTEM INFORMATION TYPE 3 and formats used in the Neighbour Cell Description IE and Cell Channel Description IE used in SYSTEM INFORMATION messages, see this clause, clause 10.5.2.1b, and clause 10.5.2.22.

NOTE 3: The network should take into account the limitations of earlier versions of mobile equipment to understand the 3-digit MNC format of the location area identification, see clause 10.5.1.3.

The information broadcast may be grouped in the following classes:

- information giving unique identification of the current network, location area and cell;
- information used for candidate cell measurements for handover and cell selection procedures;
- information describing the current control channel structure;
- information controlling the random access channel utilization;
- information defining different options supported within the cell; and
- information about the length of the part of the message belonging to the phase 1 protocol.

The network may send to the mobile station BCCH scheduling information as specified below:

1) The BCCH scheduling information may be contained in the SYSTEM INFORMATION TYPE 9 messages. If so, SYSTEM INFORMATION TYPE 3 specifies where to find SYSTEM INFORMATION TYPE 9 messages carrying BCCH scheduling information.

2) If the mobile station has received BCCH scheduling information, it shall assume that this BCCH scheduling information is valid in the location area until new scheduling information is received. It may store the information in the ME and assume its validity after switch on in the same location area.

3) The network need not indicate the schedule of all SYSTEM INFORMATION messages in SYSTEM INFORMATION 9. For any System Information message, the MS shall monitor all blocks specified in 3GPP TS 05.02 for that System Information message and all blocks specified in the SYSTEM INFORMATION TYPE 9 message for that System Information message.

4) When the mobile station detects that the BCCH information is not scheduled as defined in the last received SI 9 message, it shall read the SYSTEM INFORMATION TYPE 3 message. If presence of BCCH scheduling information in SYSTEM INFORMATION TYPE 9 message is indicated, it shall try to read the information and continue as in 2 above. If presence of BCCH scheduling information in SYSTEM INFORMATION TYPE 9 message is not indicated, it shall assume that there is no valid BCCH scheduling information.

3.2.2.2 Paging

The network is required to send valid layer 3 messages continuously on all paging subchannels on CCCH.

3.3 RR connection establishment

3.3.1 RR connection establishment initiated by the mobile station

The purpose of the immediate assignment procedure is to establish an RR connection between the mobile station and the network.

3.3.1.1 Entering the dedicated mode : immediate assignment procedure

The immediate assignment procedure can only be initiated by the RR entity of the mobile station. Initiation is triggered by request from the MM sublayer or LLC layer to enter the dedicated mode or by the RR entity in response to a PAGING REQUEST message or to initiate a notification response procedure. Upon such a request,

- if access to the network is allowed (as defined in 3.3.1.1.1), the RR entity of the mobile station initiates the immediate assignment procedure as defined in clause 3.3.1.1.2;
- otherwise, it rejects the request.

The request from the MM sublayer to establish an RR connection specifies an establishment cause. Similarly, the request from the RR entity to establish a RR connection in response to a PAGING REQUEST 1, 2 or 3 message specifies one of the establishment causes "answer to paging"; the request from the RR entity to establish an RR connection in order to initiate a notification response procedure specifies one of the establishment causes " procedures that can be completed with a SDCCH".

3.3.1.1.1 Permission to access the network

All mobile stations with an inserted SIM are members of one out of 10 access classes numbered 0 to 9. The access class number is stored in the SIM. In addition, mobile stations may be members of one or more out of 5 special access classes (access classes 11 to 15) (see 3GPP TS 22.011), this is also held on the SIM card.

The system information messages on the BCCH broadcast the list of authorized access classes and authorized special access classes in the system information messages, and whether emergency calls are allowed in the cell to all mobile stations or only to the members of authorized special access classes.

If the establishment cause for the request of the MM sublayer is not "emergency call", access to the network is allowed if and only if the mobile station is a member of at least one authorized:

- access class; or
- special access class.

If the establishment cause for the request of the MM sublayer is "emergency call", access to the network is allowed if and only if:

- emergency calls are allowed to all mobile stations in the cell or the mobile station is a member of at least one authorized special access class
- the network support voice services.

If requesting emergency call access in a cell where voice services are not available (CELL_BAR_QUALIFY_2 parameter indicates no voice service), the mobile station shall immediately go to "Any Cell Selection" state as defined in 3GPP TS 03.22, prior to establishing the emergency call.

3.3.1.1.2 Initiation of the immediate assignment procedure

The RR entity of the mobile station initiates the immediate assignment procedure by scheduling the sending on the RACH and leaving idle mode (in particular, the mobile station shall ignore PAGING REQUEST messages).

It then sends maximally M + 1 CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages on the RACH in a way such that:

- the number of slots belonging to the mobile station's RACH between initiation of the immediate assignment procedure and the first CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST message (excluding the slot containing the message itself) is a random value drawn randomly for each new initial assignment initiation with uniform probability distribution in the set {0, 1, ..., max (T,8) - 1};

- the number of slots belonging to the mobile station's RACH between two successive CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages (excluding the slots containing the messages themselves) is a random value drawn randomly for each new transmission with uniform probability distribution in the set {S, S + 1, ..., S + T - 1};

Here, T is the value of the parameter "Tx-integer" broadcast on the BCCH;

M is the value of the parameter "max retrans" broadcast on the BCCH;

S is a parameter depending on the CCCH configuration and on the value of Tx-integer as defined in Table 3.3.1.1.2.1/3GPP TS 04.18.

The CHANNEL REQUEST messages are sent on the RACH (cf. clause 1.5) and contain as parameters:

- an establishment cause which corresponds to the establishment cause given by the MM sublayer and the broadcast NECI value, or which corresponds to one of the establishment causes "answer to paging" given by the RR entity in response to a PAGING REQUEST message including the Channel Needed information, or which corresponds to one of the establishment causes " procedures that can be completed with a SDCCH" given by the RR entity in order to initiate a notification response procedure;

- a random reference which is drawn randomly from a uniform probability distribution for every new transmission.

After sending the first CHANNEL REQUEST message, the mobile station shall start listening to the BCCH; it shall also listen to the full downlink CCCH timeslot corresponding to its CCCH group.

Having sent M + 1 CHANNEL REQUEST messages, the RR entity of the mobile station starts timer T3126. At expiry of timer T3126, the immediate assignment procedure is aborted; if the immediate assignment procedure was triggered by a request from the MM sublayer, a random access failure is indicated to the MM sublayer.

Table 3.3.1.1.2.1/3GPP TS 04.18: Values of parameter S

TX-integer	non combined CCCH	combined CCH/SDCCH
3,8,14,50	55	41
4,9,16	76	52
5,10,20	109	58
6,11,25	163	86
7,12,32	217	115

3.3.1.1.3 Answer from the network

3.3.1.1.3.1 On receipt of a CHANNEL REQUEST message

The network may allocate a dedicated channel to the mobile station by sending an IMMEDIATE ASSIGNMENT message or IMMEDIATE ASSIGNMENT EXTENDED message in unacknowledged mode on the same CCCH timeslot on which it has received the CHANNEL REQUEST. There is no further restriction on what part of the downlink CCCH an IMMEDIATE ASSIGNMENT message or IMMEDIATE ASSIGNMENT EXTENDED message can be sent. The type of channel allocated (SDCCH or TCH; the channel mode shall be set to signalling only) is a network operator decision. Timer T3101 is then started on the network side.

NOTE: There are two types of immediate assignment messages:

- IMMEDIATE ASSIGNMENT message, containing assignment information for one mobile station only;
- IMMEDIATE ASSIGNMENT EXTENDED message, containing assignment information for two mobile stations at the same time.

The IMMEDIATE ASSIGNMENT or IMMEDIATE ASSIGNMENT EXTENDED message contains:

- the description of the assigned channel;
- the information field of the CHANNEL REQUEST message and the frame number of the frame in which the CHANNEL REQUEST message was received;
- the initial timing advance (cf. 3GPP TS 04.04);
- optionally, a starting time indication.

If frequency hopping is applied, the mobile station uses the last CA received on the BCCH to decode the Mobile Allocation.

On receipt of an IMMEDIATE ASSIGNMENT or IMMEDIATE ASSIGNMENT EXTENDED message corresponding to one of its 3 last CHANNEL REQUEST messages, the mobile station stops T3126 (if running), stops sending CHANNEL REQUEST messages, switches to the assigned channels, sets the channel mode to signalling only and activates the assigned channels. It then establishes the main signalling link with an SABM containing an information field (see clause 3.1.5).

An IMMEDIATE ASSIGNMENT or IMMEDIATE ASSIGNMENT EXTENDED message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions.

In the case of the reception of an IMMEDIATE ASSIGNMENT EXTENDED message, or of an IMMEDIATE ASSIGNMENT message which contains only the description of a channel to be used after the starting time, the mobile station shall wait up to the starting time before accessing the channel. If the starting time has already elapsed, the mobile shall access the channel as an immediate reaction to the reception of the message (see 3GPP TS 05.10 for the timing constraints).

If the message contains both the description of a channel to be used after the indicated time and of a channel to be used before, the mobile station accesses a channel as an immediate reaction to the reception of the message. If the moment the mobile station is ready to access is before the indicated time, the mobile station accesses the channels described for before the starting time. The mobile station then changes to the channel described for after the starting time at the indicated time. New parameters can be frequency list and MAIO. Other parameters describing the channel to be used before the starting time are taken from the description of the channel defined for use after the starting time. If the moment the mobile station is ready to access is after the starting time, the mobile station accesses the channel described for after the starting time.

If frequency hopping is applied, the mobile station uses the last CA received on the BCCH.

3.3.1.1.3.2 Assignment rejection

If no channel is available for assignment, the network may send to the mobile station an IMMEDIATE ASSIGNMENT REJECT message in unacknowledged mode on the same CCCH timeslot on which the channel request message was received. There is no further restriction on what part of the downlink CCCH timeslot an IMMEDIATE ASSIGNMENT REJECT message can be sent. This message contains the request reference and a wait indication.

On receipt of an IMMEDIATE ASSIGNMENT REJECT message corresponding to one of its 3 last CHANNEL REQUEST messages, the mobile station, stops sending CHANNEL REQUEST messages, starts timer T3122 with the indicated value, ("wait indication" information element), starts T3126 if it has not already been started, and listens to the downlink CCCH until T3126 expires. During this time, additional IMMEDIATE ASSIGNMENT REJECT messages are ignored, but any immediate assignment corresponding to any other of its 3 last CHANNEL REQUEST messages make the mobile station follow the procedure in clause 3.3.1.2. If no such immediate assignment is received, the mobile station returns to CCCH idle mode (listening to its paging channel).

As an option the mobile station may return to CCCH idle mode as soon as it has received responses from the network on all, or in case more than 3 were sent the last 3, of its CHANNEL REQUEST messages.

The mobile station is not allowed to make a new attempt to establish a non emergency RR connection in the same cell until T3122 expires. Provided that an IMMEDIATE ASSIGNMENT REJECT message has not been received for an emergency RR connection attempt, the mobile station may attempt to enter the dedicated mode for an emergency call in the same cell before T3122 has expired.

The Wait Indication IE (i.e. T3122) relates to the cell from which it was received.

The mobile station in packet idle mode (only applicable to mobile station supporting GPRS) may initiate packet access in the same cell before T3122 has expired, see 3GPP TS 04.60 and clause 3.5.2.1.3.4.

After T3122 expiry, no CHANNEL REQUEST message shall be sent as a response to a page until a PAGING REQUEST message for the mobile station is received.

3.3.1.1.4 Assignment completion

The immediate assignment procedure is terminated on the network side when the main signalling link is established. Timer T3101 is stopped and the MM sublayer on the network side is informed that the RR entity has entered the dedicated mode.

On the mobile station side, the procedure is terminated when the establishment of the main signalling link is confirmed. The MM sublayer is informed that the RR entity has entered the dedicated mode.

3.3.1.1.4.1 Early classmark sending

Early classmark sending consists in the mobile station sending as early as possible after access a CLASSMARK CHANGE message to provide the network with additional classmark information. In addition a MS supporting UTRAN sends a UTRAN Classmark Change message; an MS supporting CDMA2000 sends a CDMA2000 Classmark Change. When a CLASSMARK CHANGE message and one or more additional UTRAN Classmark Change or CDMA2000 Classmark Change messages are to be sent, the CLASSMARK CHANGE message shall be sent first.

A mobile station which implements the « Controlled Early Classmark Sending » option shall perform the early classmark sending if and only if it is accepted by the network, as indicated in the last reception in the accessed cell of the SYSTEM INFORMATION TYPE 3 message or the PACKET SYSTEM INFORMATION TYPE 2 message (see 3GPP TS 04.60). If the PACKET SYSTEM INFORMATION TYPE 2 messages have been received, but the Early Classmark Sending Control flag is not included, the mobile station may either read the SYSTEM INFORMATION TYPE 3 message or it shall assume that the early classmark sending is allowed in the cell.

A mobile station which implements support for multiple band shall also implement the « Controlled Early Classmark Sending » option.

A mobile station which implements the support of one or more 3G Radio Access Technology shall also implement the « Controlled Early Classmark Sending » option; in this case neither UTRAN CLASSMARK CHANGE nor CDMA2000 CLASSMARK CHANGE message shall be sent by the mobile if prohibited by the 3G Early Classmark Sending Restriction parameter in the last reception in the accessed cell of the SYSTEM INFORMATION TYPE 3 message or the PACKET SYSTEM INFORMATION TYPE 2 message (see 3GPP TS 04.60). If the PACKET SYSTEM INFORMATION TYPE 2 messages have been received, but the 3G Early Classmark Sending Restriction flag is not included, the mobile station shall assume neither UTRAN nor cdma2000 classmark change message shall be sent with the Early Classmark Sending.

A mobile station which implements the « multislot capability » option shall also implement the « Controlled Early Classmark Sending » option.

A mobile station that implements some form of treatment of UCS2 alphabet (see 3GPP TS 03.38) encoded character string (e.g., in short message, or in USSD string) may indicate so in the classmark. (An example is a Mobile Equipment able to display UCS2 encoded character string.) In such a case, it should also implement the « Controlled Early Classmark Sending » option. It is the mobile station responsibility to provide the UCS2 support information in due time. If the network needs this information and the mobile station did not provide it, the network may assume that the Mobile Equipment does not support UCS2.

A mobile station which implements the R-GSM band (see 3GPP TS 05.05) shall also implement the « Controlled Early Classmark Sending » option.

A mobile station which implements the extended measurement function shall also implement the « Controlled Early Classmark Sending » option.

A mobile station which implements the «GPRS» option shall also implement the « Controlled Early Classmark Sending » option.

A mobile station which implements the «SoLSA» option shall also implement the « Controlled Early Classmark Sending» option.

A mobile station which implements the «EDGE» option shall also implement the « Controlled Early Classmark Sending » option.

A mobile station which implements the «LCS» option shall also implement the « Controlled Early Classmark Sending» option.

A mobile station which implements the « Controlled Early Classmark Sending » option shall indicate it in the classmark (ES IND bit).

3.3.1.1.5 Abnormal cases

If a lower layer failure occurs on the mobile station side on the new channel before the successful establishment of the main signalling link, the allocated channels are released; the subsequent behaviour of the mobile station depends on the type of failure and previous actions.

- If the failure is due to information field mismatch in the contention resolution procedure, see clause 3.1.5, and no repetition as described in this paragraph has been performed, the immediate assignment procedure shall be repeated.
- If the failure is due to any other reason or if a repetition triggered by a contention resolution failure has been performed. The mobile station returns to idle mode (RR connection establishment failure), transactions in progress are aborted and cell reselection then may take place.

If the information available in the mobile station, after the reception of an IMMEDIATE ASSIGNMENT message does not satisfactorily define a channel, an RR connection establishment failure has occurred.

If the Mobile Allocation IE indexes frequencies in more than one frequency band then a RR connection establishment failure has occurred.

If an IMMEDIATE ASSIGNMENT message indicates (a) channel(s) in a different frequency band to which the CHANNEL REQUEST message was sent then, if the frequency band is supported by the mobile station, the mobile station shall access the indicated channel(s) with the same power control level as used for the CHANNEL REQUEST message.

If an IMMEDIATE ASSIGNMENT message indicates a channel in non-supported frequency band then a RR connection establishment failure has occurred.

On the network side, if timer T3101 elapses before the main signalling link is established, the newly allocated channels are released and the request is forgotten. Note that the network has no means to distinguish repeated attempts from initial attempts from a mobile station.

3.3.1.2 Entering the group transmit mode: uplink access procedure

Only applicable for mobile stations supporting « VGCS transmit ».

The purpose of the uplink control procedure is to establish an RR connection on a VGCS channel between a mobile station which is in group receive mode on that channel and the network.

The mobile station enters the group transmit mode when a successful establishment of the RR connection is indicated. The channel mode assumed by the mobile station is the one derived from the channel description.

3.3.1.2.1 Mobile station side

3.3.1.2.1.1 Uplink investigation procedure

The mobile station in group receive mode shall consider the uplink as free if the last message indicating the uplink as being free was received less than 480 ms ago and if no UPLINK BUSY message has been received since the last message indicating the uplink as free.

On receipt of a request from the upper layer to access the uplink and if the uplink is not free, the mobile station starts the timer T3128.

If the uplink is free or becomes free before expiry of timer T3128, then the uplink investigation procedure is terminated, the mobile station shall stop T3128, and start the uplink access procedure.

NOTE: The start of the uplink access procedure is not subject to the access class of the mobile station.

If the uplink is not indicated free before the timer expires, the mobile station shall remain in the group receive mode and indicate a reject of the uplink request to the upper layer.

3.3.1.2.1.2 Uplink access procedure

The mobile station shall send UPLINK ACCESS messages on the voice group call channel with the appropriate establishment cause. The first UPLINK ACCESS message shall be transmitted by the mobile station with a random delay between 0 and 20ms. The UPLINK ACCESS messages shall be repeated after a further period of 100ms plus a random delay between 0 and 20ms.

The UPLINK ACCESS messages contain a random reference which is drawn randomly from a uniform probability distribution. The UPLINK ACCESS messages repetitions shall contain the same random reference as the one contained in the first message.

If an uplink identity code (UIC) of the current cell has been provided by the network in the UPLINK FREE message, the mobile station shall use this UIC IE for the coding of the UPLINK ACCESS messages (see 3GPP TS 05.03). If no UIC is provided, the mobile station shall use the BSIC received from the current cell, for instance from the initial synchronization.

Having sent the first UPLINK ACCESS message, the mobile station starts timer T3130. At expiry of timer T3130, the mobile station shall repeat the same procedure if the uplink is free. A maximum of three attempts is allowed and after that a rejection of the uplink request is indicated to the upper layers.

If no VGCS UPLINK GRANT or UPLINK BUSY message is received by the mobile station 480 ms after having sent the first UPLINK ACCESS message, the mobile station shall stop sending UPLINK ACCESS messages and wait in order to receive a VGCS UPLINK GRANT or UPLINK BUSY message.

On receipt of an VGCS UPLINK GRANT message corresponding to one of its UPLINK ACCESS messages, the mobile station stops T3130, stops sending UPLINK ACCESS messages, and establishes the main signalling link with an SABM containing the TALKER INDICATION message in the information field. Early classmark sending shall be performed if applicable. If a UA is received containing the message sent, the mobile station enters the group transmit mode and indicates the successful seizure of the uplink to the upper layer. If a UA is received with a message different from the message sent, the mobile station shall remain in the group receive mode and indicate the rejection of the uplink request to the upper layers.

When receiving an UPLINK BUSY message or a VGCS UPLINK GRANT message aimed to another mobile station (i.e. not corresponding to one of its UPLINK ACCESS messages), the mobile station stops T3130 and stops sending UPLINK ACCESS messages. The mobile shall remain in the group receive mode and shall indicate a rejection of the uplink request to the upper layers.

3.3.1.2.2 Network side

On receipt of an UPLINK ACCESS message the network shall perform, if necessary, contention resolution and grant the uplink to one mobile station by sending a VGCS UPLINK GRANT message to the mobile station in unacknowledged mode on the main signalling link. Furthermore, the network shall provide UPLINK BUSY messages on the main signalling link in all cells of the group call area. After having sent the first message, the network starts T3115. If the timer expires before the reception of a correctly decoded frame from the MS, the network repeats the VGCS UPLINK GRANT message to the mobile station, reset and restarts timer T3115. If the VGCS UPLINK GRANT message has been repeated Ny2 times without a correctly decoded frame being received from the MS, the network shall stop sending VGCS UPLINK GRANT messages and provide an UPLINK FREE message on the main signalling channel and wait for a new UPLINK ACCESS message. The correct decoding of a frame means that the decoding algorithm and the error detection tests, if any, indicate no error.

After the data link layer is established, the RR entity of the network shall analyse the TALKER INDICATION message received from the mobile station, adapt the RR procedures to the new classmark if necessary and provide the mobile subscriber identity to the upper layer.

3.3.1.2.3 Abnormal cases

If a lower link failure has occurred or an indication of the release of the data link layer was provided by the lower layer and no RR release request was previously received from the upper layer, the network shall provide an UPLINK FREE message on the main signalling channel and wait for a new UPLINK ACCESS message.

3.3.1.3 Dedicated mode and GPRS

A mobile station whose Channel Request message contained a packet access establishment cause may receive an Immediate Assignment message to a Channel which is to be used in dedicated mode. A mobile station supporting the <<GPRS>> option shall obey this command. When establishing the main signalling link the information field in the SABM shall contain an RR INITIALISATION REQUEST message.

This message contains:

TLLI;

MS Classmark type 2;

Ciphering Key Sequence Number;

MAC Mode and Channel Coding Requested;

Channel Request Description.

Following a successful contention resolution procedure, the mobile station shall implement the Early Classmark Sending option. Then, the upper layers in the mobile station shall wait for commands from the network, eg for the allocation of a GPRS resource.

While on the dedicated channel the mobile station shall obey the RR management procedures of 3GPP TS 04.18, in particular the mobile station shall send measurement reports on the SACCH.

3.3.2 Paging procedure for RR connection establishment

The network can initiate the establishment of an RR connection by the paging procedure for RR connection establishment. Such a procedure can only be initiated by the network.

3.3.2.1 Paging initiation by the network

The network initiates the paging procedure to trigger RR connection establishment by broadcasting a paging request message on the appropriate paging subchannel on CCCH or PCCCH, and starts timer T3113. The paging subchannels on CCCH and PCCCH are specified in 3GPP TS 05.02 and 3GPP TS 03.13.

The network may also send paging related information on PACCH to a mobile station in packet transfer mode, see clause 3.3.2.1.3.

The network may also broadcast paging related information on any voice broadcast or voice group call channel downlink.

3.3.2.1.1 Paging initiation using paging subchannel on CCCH

Paging initiation using the paging subchannel on CCCH is used when sending paging information to a mobile station in idle mode. It is also used when sending paging information to a mobile station in packet idle mode, if PCCCH is not present in the cell.

NOTE 1: There are 3 types of paging messages which may be used on CCCH:

- PAGING REQUEST TYPE 1;
- PAGING REQUEST TYPE 2; and
- PAGING REQUEST TYPE 3.

In a PAGING REQUEST message on CCCH to trigger RR connection establishment, the mobile station shall be identified by the TMSI (non-GPRS TMSI) or its IMSI. If the mobile station is identified by the TMSI, it shall proceed as specified in clause 3.3.2.2.

If the mobile station in packet idle mode is identified by its IMSI, it shall parse the message for a corresponding *Packet Page Indication* field:

- if the *Packet Page Indication* field indicates a paging procedure for RR connection establishment, or the field is not present in the message, the mobile station shall proceed as specified in clause 3.3.2.2;
- if the *Packet Page Indication* field indicates a packet paging procedure, the mobile station shall proceed as specified in clause 3.5.1.2.

A PAGING REQUEST message on CCCH includes for each mobile station that is paged to trigger RR connection establishment an indication which defines how mobiles of different capabilities shall code the establishment cause field in the CHANNEL REQUEST message. The information received in the CHANNEL REQUEST can be used by the network to assign a suitable channel.

A PAGING REQUEST message on CCCH may include more than one mobile station identification.

A PAGING REQUEST TYPE 1 message on CCCH may have additionally a notification message coded in the P1 rest octets information element.

A PAGING REQUEST message on CCCH may also include priority levels related to the mobile station identifications. A mobile station in group receive mode supporting eMLPP shall take into account this information to decide whether to respond to this PAGING REQUEST and, if the call is answered, the mobile station shall store the priority level for the duration of the call. A mobile station not supporting eMLPP shall ignore this information element when received in a PAGING REQUEST message.

NOTE 2: A mobile station not supporting VGCS or VBS may ignore this information element when received in a PAGING REQUEST message, since the priority level is also provided in the SETUP message.

If VGCS or VBS is supported by the network and the network supports reduced NCH monitoring, messages sent on the PCH may also include an indication of the change of the information sent on the NCH (see clause 3.3.3.2).

The choice of the message type depends on the number of mobile stations to be paged and of the types of identities that are used. The maximum number of paged mobile stations per message is 4 when using only TMSIs for identification of the mobile stations.

The mobile station in idle mode is required to receive and analyse the paging messages and immediate assignment messages sent on the paging subchannel corresponding to its paging subgroup, as specified in 3GPP TS 05.02.

NOTE 3: The possible immediate assignment messages are: the IMMEDIATE ASSIGNMENT, the IMMEDIATE ASSIGNMENT EXTENDED and the IMMEDIATE ASSIGNMENT REJECT messages.

The paging and immediate assignment type messages contain a page mode information element. This information element controls possible additional requirements on mobile stations belonging to the paging subgroup corresponding to the paging subchannel the message was sent on. This implies that a given mobile station shall take into account the page mode information element of any message sent on its own paging subchannel whatever the nature of this message (paging messages or immediate assignment messages). This further implies that the mobile station does not take into account page mode information element of messages sent on paging subchannels other than its own paging subchannel. The requirements yielded by the page mode information element are as follows:

a) normal paging: no additional requirements;

b) extended paging: the mobile station is required in addition to receive and analyse the next but one message on the PCH;

c) paging reorganization: The mobile station shall receive all messages on the CCCH regardless of the BS-AG-BLKS-RES setting. It is required to receive all BCCH messages. When the mobile station receives the next message to its (possibly new) paging subgroup the subsequent action is defined in the page mode information element in that message;

d) same as before: No change of page mode from the previous page mode.

Note that a mobile station takes into account the page mode information only in messages of its own paging subchannel whatever the currently applied requirements (a, b, c or d).

When the mobile station selects a new PCH, the initial page mode in the mobile station shall be set to paging reorganization. If a message in the paging subchannel is not received correctly, the message is ignored and the previous page mode is assumed.

3.3.2.1.2 Paging initiation using paging subchannel on PCCCH

Paging initiation using a paging subchannel on PCCCH, see 3GPP TS 04.60, applies when sending paging information to a mobile station in packet idle mode and PCCCH is provided in the cell.

The paging initiation procedure and the paging request message used on PCCCH are specified in 3GPP TS 04.60.

3.3.2.1.3 Paging initiation using PACCH

Paging initiation using PACCH, see 3GPP TS 04.60, applies to a mobile station in packet transfer mode.

The paging initiation procedure and the message used to carry paging related information on PACCH are specified in 3GPP TS 04.60.

3.3.2.2 Paging response

Upon receipt of a paging request message, or other message containing information to trigger the establishment of a RR connection, and if access to the network is allowed, the addressed mobile station shall, when camped on a cell as specified in 3GPP TS 23.022, initiate the immediate assignment procedure as specified in 3.3.1. The establishment of the main signalling link is then initiated by use of an SABM with information field containing the PAGING RESPONSE message (see clause 3.1.5). The MM sublayer in the mobile station is informed that the RR entity has entered the dedicated mode.

Upon receipt of the PAGING RESPONSE message the network stops timer T3113. The MM sublayer in the network is informed that an RR connection exists.

3.3.2.3 Abnormal cases

Lower layer failure occurring during the immediate assignment procedure is treated as specified for that procedure.

If timer T3113 expires and a PAGING RESPONSE message has not been received, the network may repeat the paging request message and start timer T3113 again. The number of successive paging attempts is a network dependent choice.

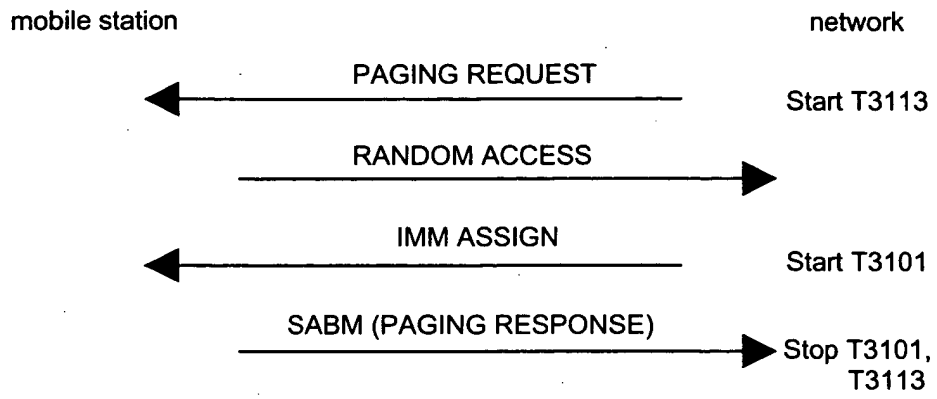

Figure 3.3.2.3.1/3GPP TS 04.18: Paging sequence

3.3.3 Notification procedure

The support of notification procedure is mandatory for mobile stations supporting « VGCS receive » and/or « VBS receive ».

The network informs the mobile station of starting or on-going voice broadcast calls and voice group calls with the notification procedure.

In cases where the mobile station has initiated a VGCS call, if the channel mode modify procedure is applied to turn the dedicated channel into a VGCS channel and ciphering may be applied for that call, in this case the network should suspend transmission of notification messages until ciphering with the group cipher key has started on the dedicated channel.

3.3.3.1 Notification of a call

The mobile station may receive a notification that a voice broadcast call or a voice group call is established. Notifications may be sent on the NCH, on the PCH, or on the FACCH when in dedicated mode or group receive mode. The presence of an NCH is indicated on the PCH in the Pi Rest Octets IE. A notification contains the group call reference and possibly other related information. This notification may be contained:

- in a NOTIFICATION/NCH message sent on the NCH to notify mobile stations of VBS or VGCS calls in the current cell, possibly together with a description of the related VBS or VGCS channel;
- in a NOTIFICATION/FACCH message sent in unacknowledged mode on the main DCCH to notify mobile stations in dedicated mode or on the main DCCH of a VGCS or VBS channel, of other VBS or VGCS calls in the current cell, possibly together with a description of the related VBS or VGCS channel;
- in the rest octets part of a PAGING REQUEST TYPE 1 message.

A mobile station supporting neither VGCS listening nor VBS listening may ignore the notifications sent on the NCH or PCH. It may also ignore the notifications sent on the main DCCH except that a RR-STATUS message shall be sent to the network with cause #97, "message not existent or not implemented".

Upon receipt of every notification message a mobile station supporting VGCS listening or VBS listening shall give an indication containing the notified group call reference(s) to upper layers in the mobile station which may then decide:

- not to react on the notification, or
- join the voice broadcast call or the voice group call, if needed after having stopped on going activities.

3.3.3.2 Joining a VGCS or VBS call

In order to join a VGCS or a VBS call the following procedures apply.

In this clause, the term **notification** refers to the notification which has triggered the decision to join a VGCS or VBS call.

If the notification on the main DCCH concerns a VBS or VGCS in the current cell and does not contain a description of the VGCS or VBS channel, the mobile station shall read the corresponding notification on the NCH.

If the description of the VGCS or VBS channel was included in the notification for the current cell, RR connection establishment shall not be initiated, instead, the mobile station shall enter the group receive mode.

If no description for the VGCS or VBS channel is included in the notification, the mobile station shall establish a RR connection in dedicated mode in order to initiate the notification response procedure.

3.3.3.3 Reduced NCH monitoring mechanism

This clause applies to mobile stations which read the NCH in idle mode in order to receive the notification messages for the voice broadcast call and the voice group call, which read the PCH to receive pagings and which aim at reducing the reception load.

A reduced NCH monitoring mechanism may be used on the NCH. When the mobile station in idle mode enters a cell and deduces from the BCCH that an NCH is present, it shall read the NCH until it has received at least two messages on the NCH indicating NLN, with the two last received NLN being identical. Then it may stop reading the NCH until it receives on the PCH an NLN(PCH) different from the last previously received NLN or on the SACCH an NLN(SACCH) different from the last previously received NLN.

A mobile is able to determine the reduced NCH monitoring is active in the network if it receives an NLN in any message. Once received, the mobile shall assume that NCH monitoring is active for a certain period of time which is not specified.

For this, parameters are provided:

- **NLN:** Notification List Number;
- The NLN is a modulo 4 counter which is changed every time a notification for a new VGCS or VBS call is started on the NCH. If the reduced NCH monitoring is indicated, the NLN provides information on new notifications provided on the NCH.
- NLN status :
  The NLN status is a single bit field which indicates the status of the content of the NOTIFICATION/NCH messages for a particular NLN value. A change of the NLN status field indicates a change of information on the NCH which is not related to new calls (e.g. There may have been a release of a previous notified call or change of priority, etc ...).

If the reduced NCH monitoringis active in the network, the network has to provide both NLN and NLN status parameters.

These parameters may be provided on the NCH, PCH and SACCH:

- **NLN(NCH):** Notification List Number (received on the NCH).
- **NLN(PCH):** Notification List Number (received on the PCH).
- **NLN(SACCH):** Notification List Number (received on the SACCH).
- **NLN status(PCH):** NLN status (received on the PCH).
- **NLN status(SACCH):** NLN status (received on the SACCH).

A mobile station supporting neither VGCS listening nor VBS listening shall ignore the NLN(NCH),NLN(PCH), NLN(SACCH) and NLN status fields.

If a mobile station (supporting VGCS listening and/or VBS listening) receives a NLN parameters on the NLN(PCH) or NLN(SACCH) field different from the last received NLN value it shall read the NCH until it has received at least two messages on the NCH indicating NLN with the two last received NLN being identical.

If a message in the paging subchannel is not received correctly, or if a paging message does not contain the information on the notification status, the mobile station shall read the NCH until it has received at least two messages on the NCH indicating NLN, with the two last received NLN being identical.

3.3.3.4 Notification response procedure

In order to initiate the notification response procedure, if access to the network is allowed, the mobile station shall, when camped on a cell as specified in 3GPP TS 03.22, initiate the immediate assignment procedure as specified in 3.3.1. The establishment of the main signalling link is then initiated by use of an SABM with information field containing the NOTIFICATION RESPONSE message (see clause 3.1.5). The MM sublayer in the mobile station is informed that the RR entity has entered the dedicated mode.

Upon receipt of the NOTIFICATION RESPONSE message the network stops timer T3101. The MM sublayer in the network may be informed that an RR connection exists; in this case, the MM sublayer may initiate MM common procedures.

The network may use the dedicated connection to order the mobile station to enter the group receive mode.

3.4 Procedures in dedicated mode and in group transmit mode

Procedures described in this clause apply to the dedicated mode and/or the group transmit mode.

Those procedures which are specific for group transmit mode or refer to transitions to the group transmit mode are only applicable for mobile stations supporting VGCS talking.

Direct transition between dedicated mode and group transmit mode is possible in both directions by use of the following procedures:

- Channel assignment procedure;
- Handover procedure;
- Channel mode modify procedure.

3.4.1 SACCH procedures

3.4.1.1 General

In dedicated mode and group transmit mode, the SACCH is used in signalling layer at least for measurement results transmission from the mobile station.

The SACCH has the particularity that continuous transmission must occur in both directions at least on the channel carrying the main signalling link. For that purpose, in the mobile station to network direction, measurement result messages are sent at each possible occasion when nothing else has to be sent (see clause 3.4.1.2). Similarly, SYSTEM INFORMATION TYPE 5, 6 and optionally 5bis and 5ter messages are sent in the network to mobile station direction in UI frames when nothing else has to be sent.

The network may in adddition send MEASUREMENT INFORMATION messages on the SACCH, which may order the MS to use the enhanced measurement report.

In a multislot configuration the SYSTEM INFORMATION TYPE 5, 6 and optionally 5bis, 5ter and MEASUREMENT INFORMATION messages shall be sent on the SACCH associated with the channel carrying the main signalling link.

In a multislot configuration the mobile station shall ignore all messages received on the SACCH(s) that are not associated with the channel carrying the main signalling link.

On a VGCS channel, the network may send additional or alternative system information messages for both mobile stations in group transmit mode and those in group receive mode (see clause 3.4.15.2.1).

A mobile station with extended measurement capabilities which receives EXTENDED MEASUREMENT ORDER (EMO) messages on the SACCH, shall perform and report extended measurements, see clause 3.4.1.3.

The SYSTEM INFORMATION TYPE 5bis message shall be sent if and only if the EXT IND bit in the Neighbour Cell Description information element in both the SYSTEM INFORMATION TYPE 5 and TYPE 5bis messages indicates that each information element only carries part of the BA.

A GSM 900 mobile station which only supports the primary GSM band P-GSM 900 (cf. 3GPP TS 05.05) may consider the EXT-IND bit in the Neighbour cell description IE in the SYSTEM INFORMATION TYPE 5 message bit as a spare bit, assume that the information element carries the complete BA, and ignore any SYSTEM INFORMATION TYPE 5bis messages.

NOTE: The network should take into account limitations of certain mobile stations to understand SYSTEM INFORMATION TYPE 5ter and TYPE 5bis messages, the EXT-IND bit in the Neighbour cell description, and formats used in the Neighbour cell description information element and Cell Channel Description information element used in SYSTEM INFORMATION messages, see clause 10.5.2.1b, and clause 10.5.2.22.

As specified in 3GPP TS 05.08, problems occurring in the reception of SACCH frames are interpreted as a loss of communication means and appropriate procedures are then triggered as specified in clause 3.4.13.

3.4.1.2 Measurement Report and Enhanced Measurement Report

When in dedicated mode or group transmit mode, the mobile station regularly sends either MEASUREMENT REPORT or ENHANCED MEASUREMENT REPORT messages to the network. These messages contain measurement results about reception characteristics from the current cell and from neighbour cells. The BA (list) which is the initial basis for the measurements is derived from information received on the BCCH in System Information 2 and optionally 2bis and/or 2ter and on the SACCH in System Information 5 and optionally 5bis and/or 5ter. MEASUREMENT INFORMATION and SI2quater messages may add information for the GSM Neighbour Cell List and provide 3G Neighbour Cell list. The Mobile Station shall use ENHANCED MEASUREMENT REPORT messages instead of MEASUREMENT REPORT messages if that is indicated by the parameter REPORT_TYPE and if at least one BSIC is allocated to each BA (list) frequency. For report with the MEASUREMENT REPORT message, reporting is performed on two separate lists: the BA (list) and the 3G Neighbour Cell List (for a multi-RAT MS). For report with the ENHANCED MEASUREMENT REPORT message, reporting is performed on the Neighbour Cell List (defined in clause 3.4.1.2.1.3).

In addition, the MS which implements ECSD options shall use fast inband procedure for downlink quality reporting if the use of such procedure has been ordered by the BSC.

When the information is received in more than one message the mobile station shall only combine information relating to the BA (list) from messages received on the same channel and indicating the same value of the BCCH allocation sequence number (BA_IND) without any message indicating a different value of BA_IND received in between. If neighbour cell information for the serving cell is not available, the mobile station indicates this in the MEASUREMENT REPORT message. These measurement results are obtained as specified in 3GPP TS 05.08.

These messages are sent on the slow ACCH, in unacknowledged mode.

If no other message is scheduled on the SACCH at the instant when a layer 2 frame is due to be sent, then the mobile station shall send a MEASUREMENT REPORT message or an ENHANCED MEASUREMENT REPORT or an EXTENDED MEASUREMENT REPORT message (see clause 3.4.1.3) in that frame. The interval between two successive layer 2 frames containing messages for measurement reporting shall not exceed one layer 2 frame.

3.4.1.2.1 Parameters for Measurements and Reporting

Parameters from the Measurement Information or SI2quater messages allow to build lists which are used for Measurement reporting and Enhanced Measurement reporting.

A full set/all instances of MEASUREMENT INFORMATION (respectively: SI2quater) messages is defined by a number of different instances indicated by the parameter MI_COUNT (respectively SI2quater_COUNT). Two different instances of MEASUREMENT INFORMATION (respectively: SI2quater) messages are two MEASUREMENT INFORMATION (respectively: SI2quater) messages with different MI_INDEX (respectively: SI2quater_INDEX) parameter values.

In Idle mode a multi-RAT MS shall read and decode a full set of SI2quater messages to form a 3G Neighbour Cell list (each instance can be used as received). When the 3G_BA_IND parameter is changed in idle mode, the MS shall re-read all instances and rebuild the 3G Neighbour Cell list. This list shall then be used for reporting when the MS enters dedicated mode, until the MS has received a given number of instances of MEASUREMENT INFORMATION messages that contain 3G Neighbour Cell Description. This number of instances is defined by the 3G-WAIT parameter. When the 3G_BA_IND parameter is changed when on SACCH, the MS shall also re-read all instances, rebuild the 3G Neighbour Cell list, and use the new list for reporting based on the parameter 3G-Wait.

For the GSM neighbour cell list the MS shall combine the BA (list) received in SI5/SI5bis/SI5ter with the BSIC list received in one or more instances of the MEASUREMENT INFORMATION message with the same BA_IND value as the BA (list). When the BA_IND is changed the MS shall rebuild the combined list (the BSIC list shall also be rebuilt). If BSICs received from the SI2quater message are used (see clause 3.4.1.2.1.2), the GSM neighbour cell list is also defined by the combination of the BA (list) received in SI2/SI2bis/SI2ter and the BSIC list from the SI2quater. When the BA_IND is changed the MS shall rebuild the combined list (the BSIC list shall also be rebuilt).

The MS shall combine the BA (list) with the Real Time Differences parameters received in the MEASUREMENT INFORMATION message with the same BA_IND value as the BA (list). When the BA_IND is changed the MS shall re-read the Real Time Differences parameters in all instances.

The MS shall combine the Neighbour Cell list with the REP_PRIORITY parameters received in the MEASUREMENT INFORMATION message with the same BA_IND and 3G_BA_IND values respectively as the Neighbour Cell list. When the BA_IND or 3G_BA_IND are changed the MS shall re-read the REP_PRIORITY parameters in all instances.

If the MP_CHANGE_MARK parameter is changed, the MS shall re-read the Real Time differences, REP_PRIORITY, Measurement Parameters and 3G Measurement Parameters in all instances. The MS shall start using the parameters as soon as they have been received. In the case that not all the parameters have been received in a full set of instances, then the default values shall be used. If different values occur for the same parameter in different instances of a message, the instance with the highest index shall be used.

3.4.1.2.1.1 Deriving the 3G Neighbour Cell list from the 3G Neighbour Cell Description:

This applies only to a multi-RAT MS. One or more instances of the Measurement Information message or SI2quater message may provide 3G Neighbour Cell Description information. This is used to build the 3G Neighbour Cell list. The 3G Neighbour Cell list may contain up to 96 3G Neighbour Cells.

Building of the 3G Neighbour Cell list:

Each *3G Neighbour Cell Description* received is added to the 3G Neighbour Cell list, starting with the index equal to the parameter Index_Start_3G. If this parameter is not present then the value 0 shall be used.

For each 3G Neighbour Cell Description, the cells are indexed in the following order:

1) UTRAN FDD cells: FDD ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then for each FDD ARFCN, the cells are indexed in the order of increasing values of the decoded FDD_CELL_INFORMATION parameters.

2) UTRAN TDD cells: TDD ARFCNs are indexed in the order of occurrence in the 3G Neighbour Cell description. Then for each TDD ARFCN, the cells are indexed in the order of increasing values of the decoded TDD_CELL_INFORMATION parameters.

3) CDMA 2000 cells: The cells are indexed in the order of occurrence in the 3G Neighbour Cell description.

If a *3G Neighbour Cell Description* includes non-supported frequencies or Radio Access Technologies, this shall not be considered as an error; indices in the 3G Neighbour Cell list shall be incremented accordingly. If more than one cell with the same index in the 3G Neighbour Cell list are provided by different instances of *3G Neighbour Cell Descriptions*, the cell from the message instance with the highest index shall be used. In case the same 3G Cell occurs more than once in the resulting 3G Neighbour Cell list, each occurrence shall be assigned an index but only the cell with the highest index in the 3G Neighbour Cell list shall be referred to in measurement reports. If a cell is provided for an index higher than 95 in the 3G Neighbour Cell list, this shall not be considered as an error; the cell shall not be included in the 3G Neighbour Cell list.

3.4.1.2.1.2 Deriving the GSM Neighbour Cell list from the BSICs and the BA (list)

One or more instances of the Measurement Information message may provide BSIC information. This is used to build the GSM Neighbour Cell list. The GSM Neighbour Cell list may contain up to 96 Neighbour Cells.

The BSICs are associated to the frequencies in the BA (list) with the same BA_IND value. The BSICs may be received before the corresponding BA (list). The first BSIC in each instance applies to the frequency in the BA (list) referenced by the parameter BA_Index_Start_BSIC. For each successive BSIC, one bit indicates if the BSIC applies to the same frequency as the previous BSIC or to the next frequency in the BA (list), as defined in clause 9.1.54, Measurement Information message.

If GPRS BSIC Description is provided in the SI2quater message (see clause 3.4.1.2.1.6), it should be saved and used by a non-GPRS mobile station as initial BSIC information in connected mode.

3.4.1.2.1.3 Deriving the Neighbour Cell list from the GSM Neighbour Cell list and the 3G Neighbour Cell list

For report with the ENHANCED MEASUREMENT REPORT message, the Neighbour Cell list is the concatenation of the GSM Neighbour Cell list and the 3G Neighbour Cell list (if any). In this concatenation the value of the parameter Absolute_Index_Start_EMR is added to the 3G Neighbour Cell list indices. The Neighbour Cell list may contain up to 96 Neighbour Cells. If the same index occurs for a GSM Cell and a 3G Cell, the GSM Cell shall be used.

NOTE: For report with the MEASUREMENT REPORT MESSAGE, the concatenated list is not used. Instead, the two lists are used separately, as defined in clause 10.5.2.20, 'Measurement Results'.

3.4.1.2.1.4 Real Time Differences

One or more instances of the Measurement Information message may provide Real Time Difference information. This is used to build the Real Time Difference list. The Real Time Difference list may contain up to 96 Real Time Difference parameters.

The Real Time Difference list is associated with the BA (list) having the same BA_IND value. Each frequency in the BA (list) may be associated to 0, 1 or more Real Time Difference parameters. The Real Time Difference parameters may be received before the corresponding BA (list). The parameter BA_Index_Start_RTD in each structure indicates the index of the frequency in the BA (list) to be taken as a starting reference. A sub-structure is included for each frequency referenced. Each of those sub-structures indicates if 0, 1 or more RTD parameters are present for this frequency. If a frequency in the BA (list) is not provided with Real Time Difference information by any of the message instances with correct BA_IND, it shall be assumed that no information is available for that frequency, see clause 9.1.54 'Measurement Information message'.

If GPRS Real Time Differences Description is provided the SI2quater message (see clause 3.4.1.2.1.6), it may also be used by a non-GPRS mobile station in Idle mode.

3.4.1.2.1.5 Report Priority Description

Report Priority information can be received in one instance of the MEASUREMENT INFORMATION message. The Report Priority information is associated with the Neighbour Cell list (see 3.4.1.2.1.3) having the same BA_IND value and 3G_BA_IND value. Each REP_PRIORITY bit of this field relates to indices of the Neighbour Cell list, starting with index 0. The Report Priority information may be received before the corresponding Neighbour Cell list.

Indices exceeding the value 95 shall be ignored. If there are fewer indices than the number of Neighbour Cells, the value 0 shall be assumed for the missing bits.

3.4.1.2.1.6 GPRS Parameters

A set of information may be received in the SI2quater message to be used for GPRS neighbour cell measurement and (NC) Measurement reporting when the cell has no PBCCH allocated, see 3GPP TS 04.60 clause 5.6 ("Measurement reports"). This information comprises GPRS Report Priority Description, GPRS BSIC Description, GPRS Real Time Differences Description, GPRS Measurement Parameters, GPRS 3G Measurement Parameters and NC Measurement Parameters. The use of the parameters is similar to parameters without the term "GPRS".

3.4.1.2.1.7 The 3G Cell Reselection list

This applies only to a multi-RAT MS. One or more instances of the SI2quater and/or SI2ter messages may provide 3G Cells. If 3G Cells are provided in both of these messages, the union of the cells shall be included in the 3G Cell Reselection list. The 3G Cell Reselection list may contain up to 96 3G Cells. 3G Cells not provided explicitly in the SI2ter message or in the SI2quater message (frequencies on their own or frequencies with SC_P_SCG bitmap) are not included in these 96 cells. Up to 8 frequencies on their own, together with up to 4 frequencies with SC_P_SCG, can be added to these 96 cells.

3.4.1.3 Extended measurement report $(MAFA)$

Only applicable to mobile stations which support extended measurement.

When in dedicated mode or group transmit mode, a mobile station may receive an EXTENDED MEASUREMENT ORDER (EMO) message, from the network. The mobile station shall then, as defined in 3GPP TS 05.08, for one reporting period perform measurements on the frequencies specified by this EMO message. The mobile station shall thereafter send an EXTENDED MEASUREMENT REPORT message. This message contains the measurement results as defined in 3GPP TS 05.08.

If the mobile station has not started to send its EXTENDED MEASUREMENT REPORT within 10 seconds after the reception of the EMO message, no EXTENDED MEASUREMENT REPORT shall be sent. The mobile station shall after a successful channel change abort any pending measurements or reporting related to an EMO message received on the old channel.

If a mobile station receives an EMO message indicating the same value of the sequence code as an EMO message received earlier on the same channel without having received any EMO message indicating a different value of the sequence code in between, that EMO message shall be ignored. If the mobile station, before the reporting related to an EMO message has started, receives a new EMO message with a different value of the sequence code, any pending measurements or reporting related to the earlier EMO message shall be aborted and the new message treated.

The EMO message and the EXTENDED MEASUREMENT REPORT message are sent on the SACCH, in unacknowledged mode.

3.4.2 Transfer of messages and link layer service provision

When in dedicated mode or in group transmit mode, upper layers can send messages in multiframe or unacknowledged mode on SAPI 0.

Moreover, but only when in dedicated mode, upper layers have access to the full link layer services for SAPIs other than 0, with the exception of the error indication and local end release that are directly treated by the RR sublayer, as specified in particular places of clause 3.

3.4.3 Channel assignment procedure

In dedicated mode, dual transfer mode or in group transmit mode, an intracell change of channel can be requested by upper layers for changing the channel type, or decided by the RR sublayer, e.g. for an internal handover. This change may be performed through the dedicated channel assignment procedure.

The purpose of the channel assignment procedure is to completely modify the physical channel configuration of the mobile station without frequency redefinition or change in synchronization while staying in the same cell.

This procedure shall not be used for changing between dependent configurations, i.e. those sharing Radio Resource for the main signalling link. An example of dependent channels is a full rate channel and one of the corresponding half rate channels. In multislot operation however, it is allowed to use the same timeslots before and after the assignment, as long as the main signalling link has been changed. The only procedures provided for changing between dependent configurations for the main signalling link are the additional assignment and the partial release procedures.

The channel assignment procedure happens only in dedicated mode, dual transfer mode and in group transmit mode. This procedure cannot be used in the idle mode; in this case the immediate assignment procedure is used.

The channel assignment procedure includes:

- the suspension of normal operation except for RR management (layer 3);
- the release of the main signalling link, and of the other data links as defined in clause 3.1.4, the disconnection of TCHs if any, and the release of packet resources, if in dual transfer mode;
- the deactivation of previously assigned channels (layer 1);
- the activation of the new channels and their connection if applicable;
- The triggering of the establishment of the data link connections for SAPI = 0.

The channel assignment procedure is always initiated by the network.

3.4.3.1 Channel assignment initiation

The network initiates the channel assignment procedure by sending an ASSIGNMENT COMMAND message to the mobile station on the main signalling link. It then starts timer T3107.

NOTE: The network should take into account limitations of certain mobile stations to understand formats used in the Frequency List IE and Cell Channel Description IE used in the ASSIGNMENT COMMAND message, see clause 10.5.2.13 and clause 10.5.2.1b.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases is suspended until resumption is indicated. These RR messages can be deduced from clauses 3.4.3 and 8.8 Radio Resource management.

Upon receipt of the ASSIGNMENT COMMAND message, the mobile station initiates a local end release of link layer connections and packet resources, if in dual transfer mode, disconnects the physical channels, commands the switching to the assigned channels and initiates the establishment of lower layer connections (this includes the activation of the channels, their connection and the establishment of the main signalling links).

The ASSIGNMENT COMMAND message contains the description of the new configuration, including for the multislot configuration and the TCH/H + TCH/H + ACCHs configuration, the exact ACCHs to be used and a power command. The power level defined in this power command shall be used by the mobile station for the initial power on the new channel(s). It shall not affect the power used on the old channel(s). The message may also contain definitions of the channel mode to be applied for one or several channel sets. If a previously undefined channel set is defined by the ASSIGNMENT COMMAND message, a definition of the channel mode for the new channel set shall be included in the message.

If the channel mode to be applied corresponds to an initial assignment of a multi-rate speech codec, the ASSIGNMENT COMMAND message shall contain the MultiRate Configuration IE, which defines the set of codec modes and related information to use on the new channel.

If the assignment is related to an intra-cell handover from a multi-rate speech codec to a multi-rate speech codec, the MultiRate Configuration IE shall be included in the case of full rate to half rate. If not included in this case, the mobile station shall behave as if the MultiRate Configuration IE was inconsistent. If not included in other cases, the MS shall use on the new channel the AMR configuration it was using on the old channel when it received the ASSIGNMENT COMMAND message.

An ASSIGNMENT COMMAND message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions.

In the case of the reception of an ASSIGNMENT COMMAND message which contains only the description of a channel to be used after the starting time, the mobile station shall wait up to the starting time before accessing the channel. If the starting time has already elapsed, the mobile shall access the channel as an immediate reaction to the reception of the message (see 3GPP TS 05.10 for the timing constraints).

If the message contains both the description of a channel to be used after the indicated time and of a channel to be used before, the mobile station accesses a channel as an immediate reaction to the reception of the message. If the moment the mobile station is ready to access is before the indicated time, the mobile station accesses the channels described for before the starting time. The mobile station then changes to the channel described for after the starting time at the indicated time. New parameters can be frequency list, MAIO and HSN. Other parameters describing the allocated channels must be identical to the parameters described for before the starting time. If the moment the mobile station is ready to access is after the starting time, the mobile station accesses the channel described for after the starting time.

If frequency hopping is applied, the cell allocation if present in the message is used to decode the mobile allocation. If the cell allocation is not included, the mobile station uses its current cell allocation, the current CA is the last CA received on the BCCH. Afterward, the current CA may be changed by some messages sent on the main signalling link containing a CA (the possible messages are: ASSIGNMENT COMMAND, HANDOVER COMMAND and FREQUENCY REDEFINITION). Note that there are cases in which the current CA is undefined, see clause 3.4.3.3.

The ASSIGNMENT COMMAND message may contain a cipher mode setting IE. In that case, this ciphering mode has to be applied on the new channel. If no such information is present, the ciphering mode is the same as on the previous channel. In either case the ciphering key shall not be changed. The ASSIGNMENT COMMAND message shall not contain a cipher mode setting IE that indicates "start ciphering" unless a CIPHERING MODE COMMAND message has been transmitted earlier in the RR connection: if such an ASSIGNMENT COMMAND message is received it shall be regarded as erroneous, an ASSIGNMENT FAILURE with cause "Protocol error unspecified" message shall be returned immediately, and no further action taken.

In a voice group call, the ASSIGNMENT COMMAND message may contain a VGCS target mode information element defining which RR mode is to be used on the new channel (i.e. dedicated mode or group transmit mode). If this information element is not present, the mode shall be assumed to be the same as on the previous channel. The VGCS target mode information element shall also indicate the group cipher key number for the group cipher key to be used on the new channel or if the new channel is non ciphered. If the information element is not present, the ciphering mode and group cipher key shall be the same as on the previous channel. Mobile stations not supporting VGCS talking shall ignore the ASSIGNMENT COMMAND message if the VGCS target mode information element is included in the message and shall send an RR STATUS message to the network with cause #96. If a VGCS target mode information element and a cipher mode setting information element is included in the same message, then a mobile station supporting VGCS talking mobile shall regard the ASSIGNMENT COMMAND message as erroneous, an ASSIGNMENT FAILURE message with cause "Protocol error unspecified" shall be returned immediately, and no further action taken.

3.4.3.2 Assignment completion

After the main signalling link is successfully established, the mobile station returns an ASSIGNMENT COMPLETE message, specifying cause "normal event", to the network on the main DCCH.

The sending of this message on the mobile station side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those belonging to RR management.

At the receipt of the ASSIGNMENT COMPLETE message, the network releases the previously allocated resources and stops timer T3107.

3.4.3.3 Abnormal cases

If the mobile station has no current CA and if it needs a CA to analyse the ASSIGNMENT COMMAND message, it stays on the current channel(s) and sends an ASSIGNMENT FAILURE message with cause "no cell allocation available".

If the ASSIGNMENT COMMAND message instructs the mobile station to use a Channel Description or Mode that it does not support, or if the Channel Mode to use is not defined for all channel sets, then the mobile station shall return an ASSIGNMENT FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Channel Mode(s).

If the mobile station receives an ASSIGNMENT COMMAND message containing an inconsistent MultiRate Configuration IE, then the mobile station shall return an ASSIGNMENT FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Channel Mode(s).

The MultiRate Configuration IE shall be considered as inconsistent by the MS if:

- the active set does not include any codec mode or the active set includes more than four codec modes; or
- one or more codec modes of the active codec set are not supported by the assigned channel; or
- the threshold and hysteresis values are not set according to requirements given in 3GPP TS 05.09.

If during the initial assignment of the multirate speech the mobile station receives an ASSIGNMENT COMMAND message and the MultiRate Configuration IE is not present, then the mobile station shall return an ASSIGNMENT FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Channel Mode(s).

If the ASSIGNMENT COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return an ASSIGNMENT FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

If the mobile station receives an ASSIGNMENT COMMAND message with a Frequency List IE indicating frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send an ASSIGNMENT FAILURE message with cause "frequency not implemented". If the mobile station receives an ASSIGNMENT COMMAND message with a Mobile Allocation IE indexing frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send an ASSIGNMENT FAILURE message with cause "frequency not implemented".

NOTE: An ASSIGNMENT COMMAND message sent to a multi band mobile station shall not be considered invalid because it indicates frequencies that are all in a different frequency band to that of the current channel.

On the mobile station side, if a lower layer failure happens on the new channel before the ASSIGNMENT COMPLETE message has been sent, the mobile station deactivates the new channels, reactivates the old channels, reconnects the TCHs if any and triggers the establishment of the main signalling link. It then sends a ASSIGNMENT FAILURE message, cause "protocol error unspecified" on the main DCCH and resumes the normal operation, as if no assignment attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the procedure.

When receiving the ASSIGNMENT FAILURE message, the network stops T3107.

If a lower layer failure happens while attempting to connect back to the old channels, the radio link failure procedure is applied (see clause 3.4.13.2 for dedicated mode and 3.4.13.5 for group transmit mode).

On the network side, if timer T3107 elapses before either the ASSIGNMENT COMPLETE message has been received on the new channels or an ASSIGNMENT FAILURE message is received on the old channels, the old channels and the new channels are released if they both were dedicated channels and, unless the mobile station has re-established the call, all contexts related to the connections with that mobile station are cleared. If one of the channels was a VGCS channel, it shall be maintained and the uplink shall be set free. If both channels were VGCS channels, the network shall maintain one of the channels and the uplink shall be set free.

On the network side, lower layer failure occurring on the old channels after the sending of the ASSIGNMENT COMMAND message are ignored. Lower layer failures occurring after the receipt of the SABM Frame on the new main signalling link are treated following the general rules (cf. clause 3.5.2).

3.4.4 Handover procedure

In dedicated mode, dual transfer mode or group transmit mode, an intercell or intracell change of channel(s) can be requested by the network RR sublayer. This change may be performed through the handover procedure

NOTE: The decision to do a handover and the choice of the new cell is out of the scope of this technical specification.

The purpose of the handover procedure is to completely modify the channels allocated to the mobile station e.g. when the cell is changed. A change in the channel configuration nature is possible. This procedure is used only while in dedicated mode, dual transfer mode or group transmit mode.

The handover procedure is also used by Location Services as described in 3GPP TS 23.071.

The handover procedure shall not be used for changing between dependent configurations (see clause 3.4.3). An exception to this is when the handover procedure is used by Location Services. In this case the mobile may be commanded to attempt a handover to the same channel as currently assigned to the MS. The MS shall attempt to perform a handover to this unchanged channel, which includes the transmission of access bursts.

The handover procedure includes:

- The suspension of normal operation except for RR management (layer 3).
- The disconnection of the main signalling link, and of the other links via local end release (layer 2), and the disconnection of the TCH(s) if any.

- The abortion of the packet resources (see 3GPP TS 04.60), if in class A mode of operation.
- The disconnection and the deactivation of previously assigned channels and their release (layer 1).
- The activation of the new channels, and their connection if applicable.
- The triggering of the establishment of data link connection for SAPI = 0 on the new channels.

The handover procedure is always initiated by the network.

3.4.4.1 Handover initiation

The network initiates the handover procedure by sending a HANDOVER COMMAND message to the mobile station on the main DCCH. It then starts timer T3103.

If the HANDOVER COMMAND message refers to a cell to which the mobile station is not synchronised to, this shall not be considered as an error (see 3GPP TS 05.08).

NOTE: The network should take into account limitations of certain mobile stations to understand formats used in the Frequency List IE, Frequency Short List IE, and Cell Channel Description IE used in the HANDOVER COMMAND message, see clause 10.5.2.13, clause 10.5.2.14, and clause 10.5.2.1b.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases, is suspended until resuming is indicated. These RR messages can be deduced from clause 3.4.3 and 8.5.1 "Radio Resource management".

Upon receipt of the HANDOVER COMMAND message, the mobile station initiates, as described in clause 3.1.4, the release of link layer connections, disconnects the physical channels (including the packet resources, if in class A mode of operation), commands the switching to the assigned channels and initiates the establishment of lower layer connections (this includes the activation of the channels, their connection and the establishment of the data links).

The HANDOVER COMMAND message contains:

- The characteristics of the new channels, including for the multislot configuration and the TCH/H + TCH/H + ACCHs configuration the exact ACCHs to be used. The message may also contain definitions of the channel mode to be applied for one or several channel sets. If a previously undefined channel set is defined by the HANDOVER COMMAND message, a definition of the channel mode for the new channel set shall be included in the message.
- The characteristics of the new cell that are necessary to successfully communicate (e.g. frequency list in the case of slow frequency hopping), including the data that allows the mobile station to use the pre-knowledge about synchronization it acquires by the measurement process (i.e. BSIC + BCCH frequency).
- A power command (cf. 3GPP TS 05.08). The power level defined in this power command shall be used by the mobile station for the initial power on the new channel(s). It shall not affect the power used on the old channel(s).
- An indication of the physical channel establishment procedure to be used.
- A handover reference, used as specified in the following clause. The choice of the handover reference by the network is out of the scope of this specification and left to the manufacturers.
- Optionally a timing advance to be used on the new cell.

- Optionally a cipher mode setting. In that case, this ciphering mode has to be applied on the new channel. If no such information is present, the ciphering mode is the same as on the previous channel. In either case the ciphering key shall not be changed. In case of 2G to 2G handover, the HANDOVER COMMAND message shall not contain a cipher mode setting IE that indicates "start ciphering" unless a CIPHERING MODE COMMAND message has been transmitted previously in this instance of the dedicated mode : if such a HANDOVER COMMAND message is received it shall be regarded as erroneous, a HANDOVER FAILURE message with cause "Protocol error unspecified" shall be returned immediately, and no further action taken. In the case of UTRAN to GSM handover, the HANDOVER COMMAND message, which is sent transparently via RNC from BSS to the mobile station, shall always contain the cipher mode setting IE to indicate the ciphering mode to be used in GSM. In the case of CDMA2000 to GSM handover, the HANDOVER COMMAND message, which is sent transparently via RNC from BSS to the mobile station, shall always contain the cipher mode setting IE.

- Optionally, in a voice group call, a VGCS target mode information element defining which RR mode is to be used on the new channel (i.e. dedicated mode or group transmit mode). If this information element is not present, the mode shall be assumed to be the same as on the previous channel. The VGCS target mode information element shall also indicate the group cipher key number for the group cipher key to be used on the new channel or if the new channel is non ciphered. If the information element is not present, the ciphering mode and ciphering key shall be the same as on the previous channel. Mobile stations not supporting VGCS talking shall ignore the HANDOVER COMMAND message if the VGCS target mode information element is included in the message and shall send an RR STATUS message to the network with cause #96. If a VGCS target mode information element and a cipher mode setting information element is included in the same message, then a mobile station supporting VGCS talking shall regard the HANDOVER COMMAND message as erroneous, an HANDOVER FAILURE message with cause "Protocol error unspecified" shall be returned immediately, and no further action taken.

- Optionally, when the channel mode indicates that a multi-rate speech codec must be applied, the MultiRateconfiguration to be used in the new cell. The MultiRate Configuration IE defines the set of codec mode and related information to use after the handover. When accessing the new channel, the mobile station shall use for the Initial Codec Mode the mode specified in the MultiRate Configuration IE, if present, or apply by default the implicit rule defined in 3GPP TS 05.09.

In addition, a HANDOVER COMMAND message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions.

In the case of the reception of a HANDOVER COMMAND message which contains only the description of a channel to be used after the starting time, the mobile station shall wait up to the starting time before accessing the channel. If the starting time has already elapsed, the mobile shall access the channel as an immediate reaction to the reception of the message (see 3GPP TS 05.10 for the timing constraints).

In the case of a handover towards a GSM cell to which the mobile station is not synchronised to and in the case of an intersystem handover to GSM, at the reception of a HANDOVER COMMAND message which contains only the description of a channel to be used after the starting time, the mobile station shall wait up to the starting time before accessing the new channel. If the starting time has already elapsed, the mobile shall access the new channel as an immediate reaction to the reception of the message (see 3GPP TS 05.10 for the timing constraints). Between the reception of the HANDOVER COMMAND and the starting time there is no requirement for the mobile station to receive or transmit on the old channel.

NOTE: This case may result to a long interruption and should not be used.

If the message contains both the description of a channel to be used after the indicated time and of a channel to be used before, the mobile station accesses a channel as an immediate reaction to the reception of the message. If the moment the mobile station is ready to access is before the indicated time, the mobile station accesses the channels described for before the starting time. The mobile station then changes to the channel described for after the starting time at the indicated time. New parameters can be frequency list, MAIO and HSN. Other parameters describing the allocated channels must be identical to the parameters described for before the starting time. If the moment the mobile station is ready to access is after the starting time, the mobile station accesses the channel described for after the starting time.

If the channel mode indicates that a multi-rate speech codec must be applied, and the MultiRateConfiguration IE is not included in the HANDOVER COMMAND message, then the mobile station shall use on the new channel the AMR configuration it was using on the old channel when it received the HANDOVER COMMAND message. The MultiRate Configuration IE shall be included in the case of full rate channel to half rate channel handover. If not included in this case, the mobile station shall behave as if the MultiRate Configuration IE was inconsistent.

3.4.4.2 Physical channel establishment

Four procedures are defined. The support of three of them is mandatory in the mobile station. The pseudo-synchronization case is optional in the mobile station. A pseudo-synchronized handover can be commanded only to a mobile station that can support it, as indicated in the classmark.

3.4.4.2.1 Finely synchronized cell case

If the mobile station knows that the timing advance with the new cell is not out of range, i.e. smaller than or equal to the maximum timing advance that can be coded as specified in 3GPP TS 04.04, or if the new cell does accept out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station proceeds as follows.

After having switched to the assigned channels, the mobile station sends four times the HANDOVER ACCESS message in four successive layer 1 frames on the main DCCH. This message is sent in an access burst. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. MS shall not send additional bursts on the SACCH.

It then activates the channels in sending and receiving mode and connects the channels if need be.

If applicable, ciphering is immediately started . The access bursts are not ciphered.

3.4.4.2.2 Non synchronized cell case

After having switched to the assigned channels, the mobile station starts repeating the HANDOVER ACCESS message in successive layer 1 frames on the main DCCH and optionally on the SACCH. This message is sent in an access burst. Its content is reduced to the handover reference information element. The mobile station starts timer T3124 at the start point of the timeslot in which the HANDOVER ACCESS message is sent the first time on the main DCCH.

The mobile station then activates the channels in receiving mode and connects the channels if need be (only for reception).

If applicable, deciphering is then immediately started . The access bursts are not ciphered.

When the network has the RF characteristics that are necessary, it sends in unacknowledged mode a PHYSICAL INFORMATION message to the mobile station on the main DCCH. If applicable, ciphering and deciphering is immediately started (i.e., before even the reception of a correct access burst), and the message is sent enciphered.

The PHYSICAL INFORMATION message contains various physical layer related information, allowing a proper transmission by the mobile station.

When sending the PHYSICAL INFORMATION message, the network starts timer T3105. If this timer times out before the reception of a correctly decoded layer 2 frame in format A or B (see 3GPP TS 04.06), or a correctly decoded TCH frame from the mobile station, the network repeats the PHYSICAL INFORMATION message and restarts timer T3105. The maximum number of repetitions is Ny1.

The correct decoding of a frame means that the decoding algorithm and the error detection tests, if any, indicate no error.

When the mobile station receives a PHYSICAL INFORMATION message, it stops timer T3124, stops sending access bursts, activates the physical channels in sending and receiving mode and connects the channels if need be. If the allocated channel is an SDCCH (+ SACCH), performance of the mobile station must enable the mobile station to accept a correct PHYSICAL INFORMATION message sent by the network in any block while T3124 is running.

3.4.4.2.3 Pseudo-synchronized cell case

The details of the use of this procedure are described in 3GPP TS 05.10. The mobile station computes the timing advance to be used with the new cell from the real time difference value given in the HANDOVER COMMAND message. If the mobile station knows that the timing advance with the new cell is not out of range , i.e. smaller or equal to the maximum timing advance that can be coded as specified in 3GPP TS 04.04, or if the new cell accepts an out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station switches to the new channel and proceeds as follows.

After having switched to the assigned channels, the mobile station sends in four successive slots on the main DCCH a HANDOVER ACCESS message. This message is sent in random mode and thus does not follow the basic format. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. The MS shall not send additional bursts on the SACCH.

The mobile station then activates the channels in sending and receiving mode and connects the channels if need be. The mobile station may activate the channels in receiving mode and connect the channels while sending access bursts.

If applicable, ciphering is then immediately started. The access bursts are not ciphered.

3.4.4.2.4 Pre-synchronized cell case

The details of the use of this procedure are described in 3GPP TS 05.10. The mobile station switches to the new channel and proceeds as follows.

After having switched to the assigned channels, the mobile station sends in four successive slots on the main DCCH a HANDOVER ACCESS message. This message is sent in an access burst and thus does not follow the basic format. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. MS shall not send additional bursts on the SACCH.

The mobile station then activates the channel in sending and receiving mode and connects the channels if need be. The timing advance value to be used with the new cell is:

- either the value contained in the HANDOVER COMMAND message if the timing advance information element is present;
- or the default value for pre-synchronized handover as defined in 3GPP TS 05.10, if the timing advance information element is not included in the HANDOVER COMMAND message. The MS may activate the channels in receiving mode and connect the channels while sending access bursts.

If applicable, ciphering is immediately started. The access bursts are not ciphered.

3.4.4.3 Handover completion

After lower layer connections are successfully established, the mobile station returns a HANDOVER COMPLETE message, specifying cause "normal event", to the network on the main DCCH.

The sending of this message on the mobile station side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those for RR management.

When receiving the HANDOVER COMPLETE message, the network stops timer T3103 and releases the old channels.

If requested to do so in the HANDOVER COMMAND message, the mobile station includes the observed time difference it has measured when performing the handover, corrected by half the timing advance, in the HANDOVER COMPLETE message (detailed specifications are given in 3GPP TS 05.10).

If the new cell supports DTM and the mobile station was in DTM in the old cell or the network does not have enough information about the RR mode in the old cell, the network sends the DTM INFORMATION message on the main DCCH after the HANDOVER COMPLETE message has been received.

3.4.4.4 Abnormal cases

In the case of a synchronous or pseudo-synchronous handover, if the mobile station knows that the timing advance with the new cell is out of range, i.e. is bigger than the maximum timing advance that can be coded as specified in 3GPP TS 04.04, and if the new cell does not accept out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station sends a HANDOVER FAILURE message, cause "handover impossible, timing advance out of range", on the main signalling link and does not attempt that handover.

If the HANDOVER COMMAND message instructs the mobile station to use a Channel Description or Mode that it does not support, or if the Channel Mode to use is not defined for all channel sets, then the MS shall return a HANDOVER FAILURE message with cause "channel mode unacceptable", and the MS shall remain on the current channel(s) and uses the old Channel Description or Mode(s).

If the mobile station receives a HANDOVER COMMAND message containing an inconsistent MultiRateConfiguration IE, then the mobile station shall return a HANDOVER FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Mode(s).

The MultiRate Configuration IE shall be considered as inconsistent by the MS if:

- the active set does not include any codec mode or the active set includes more than four codec modes; or
- one or more codec modes of the active codec set are not supported by the assigned channel; or
- the threshold and hysteresis values are not set according to requirements given in TS 3GPP 05.09.

If the HANDOVER COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return a HANDOVER FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

If the mobile station receives a HANDOVER COMMAND message with a Frequency List IE or Frequency Short List IE indicating frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send a HANDOVER FAILURE message with cause "frequency not implemented". If the mobile station receives a HANDOVER COMMAND message with a Mobile Allocation IE indexing frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send a HANDOVER FAILURE message with cause "frequency not implemented".

NOTE: A HANDOVER COMMAND message sent to a multi band mobile station shall not be considered invalid because it indicates target channel frequencies that are all in a different frequency band to that of the ARFCN in the Cell Description IE.

On the mobile station side, if timer T3124 times out (only in the non- synchronized case) or if a lower layer failure happens on the new channel before the HANDOVER COMPLETE message has been sent, the mobile station deactivates the new channels, reactivates the old channels, reconnects the TCHs if any and triggers the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation as if no handover attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the HANDOVER COMMAND message was received.

When the HANDOVER FAILURE message has been received, the network releases the new channels if they were dedicated channels and stops timers T3105 and stops T3103 in the non-synchronized case. If the new channels were VGCS channels, they shall be maintained.

If a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied (cf. clause 3.4.13.2 for dedicated mode and 3.4.13.5 for group transmit mode).

On the network side, if timer T3103 elapses before either the HANDOVER COMPLETE message is received on the new channels, or a HANDOVER FAILURE message is received on the old channels, or the mobile station has re-

established the call, the old channels are released if they were dedicated channels and all contexts related to the connections with that mobile station are cleared. If the old channel was a VGCS channel, it shall be maintained and the uplink shall be set free.

On the network side, if neither a correctly layer 2 frame in format A or B nor a correctly TCH frame have been received from the mobile station on the new channel, the newly allocated channels are released if they were dedicated channels. If the new channels were VGCS channels, they shall be maintained and the uplink shall be set free.

On the network side, lower layer failures occurring on the old channels after the sending of the HANDOVER COMMAND message are ignored. Lower layer failures occurring after the receipt of the SABM frame on the new main signalling link are treated following a general scheme (cf. clause 3.4.13.2 for dedicated mode and 3.4.13.5 for group transmit mode).

3.4.4a Handover to UTRAN procedure

Only valid for a UTRAN capable MS. In dedicated mode or dual transfer mode, a change to UTRAN channel(s) can be requested by the network RR sublayer. This change is performed through the handover to UTRAN procedure.

NOTE: The decision to do a handover to UTRAN and the choice of the new cell is out of the scope of this technical specification.

The handover to UTRAN procedure includes:

- The suspension of normal operation except for RR management (layer 3).
- The disconnection of the main signalling link, and of the other links via local end release (layer 2), and the disconnection of the TCH(s) if any.
- The disconnection and the deactivation of previously assigned channels and their release (layer 1).
- The abortion of the packet resources (see 3GPP TS 04.60), if in class A mode of operation.
- The establishment of UTRAN channel(s), see 3GPP TS 25.331.

The handover to UTRAN procedure is always initiated by the network.

3.4.4a.1 Handover to UTRAN initiation

The network initiates the handover to UTRAN procedure by sending an INTER SYSTEM TO UTRAN HANDOVER COMMAND message to the mobile station on the main DCCH. It then starts timer T3121.

If the INTER SYSTEM TO UTRAN HANDOVER COMMAND refers to a not known cell (see 3GPP TS 25.133 and 3GPP TS 25.123), this shall not be considered as an error.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases, is suspended until resuming is indicated. These RR messages can be deduced from clause 3.4.3 and 8.5.1 "Radio Resource management".

Upon receipt of the INTER SYSTEM TO UTRAN HANDOVER COMMAND message, the mobile station initiates, as described in clause 3.1.4, the release of link layer connections and disconnects the physical channels (including the packet resources, if in class A mode of operation). Switching to the assigned cell(s) and physical channel establishment is described in 3GPP TS 25.331.

3.4.4a.2 Handover to UTRAN completion

NOTE: After lower layer connections are successfully established, the mobile station returns a Handover to UTRAN Complete message on UTRAN channels(s), see 3GPP TS 25.331.

When receiving the Handover to UTRAN Complete message (3GPP TS 25.331), the network stops timer T3121 and releases the old channels.

3.4.4a.3 Abnormal cases

If the INTER SYSTEM TO UTRAN HANDOVER COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall stay on the current channel(s) and return a HANDOVER FAILURE message with cause "frequency not implemented".

If the INTER SYSTEM TO UTRAN HANDOVER COMMAND message instructs the mobile station to use a UTRAN predefined configuration that the mobile station has not read or instructs to use a default configuration not implemented by the mobile station, then the mobile station shall stay on the current channel(s) and return a HANDOVER FAILURE message with cause "UTRAN configuration unknown". If connection is not possible on the UTRAN channel(s) (see 3GPP TS 25.331), the MS reactivates the old channel(s) and reconnects TCHs and triggers the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation.

When sending a HANDOVER FAILURE message in response to an INTERSYSTEM TO UTRAN HANDOVER COMMAND, the mobile station shall erase all the UTRAN predefined configurations .

When the HANDOVER FAILURE message has been received, the network releases the UTRAN channel(s) if they were dedicated channels and stops timer T3121.

If a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied (cf. clause 3.4.13.2 for dedicated mode).

On the network side, if timer T3121 elapses before either the Handover to UTRAN Complete (3GPP TS 25.331) message is received on the UTRAN channel(s), or a HANDOVER FAILURE message is received on the old channels, or the mobile station has re-established the call, the old channels are released if they were dedicated channels and all contexts related to the connections with that mobile station are cleared.

On the network side, lower layer failures occurring on the old channels after the sending of the INTER SYSTEM TO UTRAN HANDOVER COMMAND message are ignored.

3.4.4b Handover to CDMA2000 procedure

Only valid for a CDMA2000 capable MS. In dedicated mode or dual transfer mode, a change to CDMA2000 channel(s) can be requested by the network RR sublayer. This change is performed through the handover to CDMA2000 procedure.

NOTE: The decision to do a handover to CDMA2000 and the choice of the new cell is out of the scope of this technical specification.

The handover to CDMA2000 procedure includes:

- The suspension of normal operation except for RR management (layer 3).
- The disconnection of the main signalling link, and of the other links via local end release (layer 2), and the disconnection of the TCH(s) if any.
- The disconnection and the deactivation of previously assigned channels and their release (layer 1).
- The abortion of the packet resources (see 3GPP TS 04.60), if in class A mode of operation.
- The establishment of CDMA2000 channel(s), see TIA/EIA/IS-833 and TIA/EIA/IS-2000-5-A.

The handover to CDMA2000 procedure is always initiated by the network.

3.4.4b.1 Handover to CDMA2000 initiation

The network initiates the handover to CDMA2000 procedure by sending an INTER SYSTEM TO CDMA2000 HANDOVER COMMAND message to the mobile station on the main DCCH. It then starts timer T3123.

If the INTER SYSTEM TO CDMA2000 HANDOVER COMMAND refers to a not known base station (see TIA/EIA/IS-98-D), this shall not be considered as an error.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases, is suspended until resuming is indicated. These RR messages can be deduced from clause 3.4.3 and 8.5.1 "Radio Resource management".

Upon receipt of the INTER SYSTEM TO CDMA2000 HANDOVER COMMAND message, the mobile station initiates, as described in clause 3.1.4, the release of link layer connections and disconnects the physical channels (including the packet resources, if in class A mode of operation). Switching to the assigned base stations and physical channel establishment is described in TIA/EIA/IS-2000-5-A.

3.4.4b.2 Handover to CDMA2000 completion

NOTE: After lower layer connections are successfully established, the mobile station returns a Handoff Completion Message on CDMA2000 channels(s), see TIA/EIA/IS-833.

When receiving the Handoff Completion Message (TIA/EIA/IS-833), the network stops timer T3123 and releases the old channels.

3.4.4b.3 Abnormal cases

If the INTER SYSTEM TO CDMA2000 HANDOVER COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return a HANDOVER FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

If connection is not possible on the CDMA2000 channel(s) (see TIA/EIA/IS-2000-5-A), the MS reactivates the old channels, reconnects TCHs and triggers the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation.

When the HANDOVER FAILURE message has been received, the network releases the CDMA2000 channel(s) if they were dedicated channels and stops timer T3123.

If a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied (cf. clause 3.4.13.2 for dedicated mode).

On the network side, if timer T3123 elapses before either the Handoff Completion Message (TIA/EIA/IS-833) is received on the CDMA2000 channel(s), or a HANDOVER FAILURE message is received on the old channels, or the mobile station has re-established the call, the old channels are released if they were dedicated channels and all contexts related to the connections with that mobile station are cleared.

On the network side, lower layer failures occurring on the old channels after the sending of the INTER SYSTEM TO CDMA2000 HANDOVER COMMAND message are ignored.

3.4.5 Frequency redefinition procedure

In dedicated mode and group transmit mode, this procedure is used by the network to change the frequencies and hopping sequences of the allocated channels. This is meaningful only in the case of frequency hopping.

The network sends to the mobile station a FREQUENCY REDEFINITION message containing the new parameters together with a starting time indication.

NOTE: The network should take into account limitations of certain mobile stations to understand formats used in the Cell Channel Description IE used in the FREQUENCY REDEFINITION message, see clause 10.5.2.13.

When receiving such a message, the mobile station modifies the frequencies/hopping sequences it uses at the exact indicated time slot, i.e. the indicated time slot is the first with new parameters. All other functions are not disturbed by this change. New parameters can be the cell channel description, the mobile allocation and the MAIO. In case of multislot configuration, the Channel Description IE shall describe the channel carrying the main signalling link, the new parameters however, shall be used for all assigned timeslots. Other parameters describing the allocated channels must be identical to the current parameters.

3.4.5.1 Abnormal cases

If the mobile station receives a FREQUENCY REDEFINITION message with a Mobile Allocation IE indexing frequencies that are not all in one band and a Starting Time IE indicating a time that has not elapsed, then the mobile station shall stay on the current channel(s) and send a RR STATUS message with cause "frequency not implemented".

If the mobile station receives a FREQUENCY REDEFINITION message with a Mobile Allocation IE indexing frequencies that are not all in one band and a Starting Time IE indicating a time that has elapsed, then the mobile station shall locally abort the radio connection and, if permitted, attempt Call Re-establishment.

If the mobile station receives a FREQUENCY REDEFENITION message on a channel for which it has a pending redefinition (defined by the immediate assignment, assignment or handover procedure or a previous frequency redefinition procedure) the frequencies, hopping and starting time parameters defined by the new frequency redefinition procedure supersedes those of the pending one.

NOTE: A FREQUENCY REDEFINITION message sent to a multi band mobile station shall not be considered invalid because it indicates new frequencies that are all in a different frequency band to that of the ARFCN of the serving cell.

3.4.6 Channel mode modify procedure

In dedicated mode or group transmit mode, higher layers can request the setting of the channel mode.

The channel mode modify procedure allows the network to request the mobile station to set the channel mode for one channel or one channel set. The procedure shall not be used if the multislot configuration contains more than one channel set. The channel mode covers the coding, decoding and transcoding mode used on the indicated channel.

This message shall not be used to modify the mode of a non-multislot configured traffic channel when the MS has requested a multislot configuration, ie it cannot be used to modify the mode of a traffic channel when the channel was assigned during the immediate assignment procedure and the user has requested a multislot configuration.

This procedure is always initiated by the network.

NOTE: Direct transitions between full rate speech coder version 1 and full rate speech coder version 2 (and vice versa) may cause unpleasant audio bursts.

3.4.6.1 Normal channel mode modify procedure

3.4.6.1.1 Initiation of the channel mode modify procedure

The network initiates the procedure by sending a CHANNEL MODE MODIFY message to the mobile station. This message contains:

- a channel description of the channel(s) on which the mode in the CHANNEL MODE MODIFY message shall be applied; and
- the mode to be used on that channel, or on all the channels of a channel set in a multislot configuration.
- Optionally, when the channel mode indicates that a multi-rate speech codec must be applied, the MultiRateconfiguration to be used. The MultiRateConfiguration IE defines the set of codec modes and related information to use after the mode modify procedure.

If the channel mode is changed from a non multi-rate speech codec to a multi-rate speech codec, the CHANNEL MODE MODIFY message shall contain the MultiRate Configuration IE, which defines the set of codec modes and related information to use as a new mode.

If the old channel mode and the new channel mode are both multi-rate speech codec, the MultiRate Configuration IE may not be present. If not present, the MS shall go on with the current multi-rate speech configuration.

3.4.6.1.2 Completion of channel mode modify procedure

When it has received the CHANNEL MODE MODIFY message, the mobile station sets the mode for the indicated channel, and if that is in a multislot configuration, the whole channel set and then replies by a CHANNEL MODE MODIFY ACKNOWLEDGE message indicating the ordered channel mode.

This applies whether the mode commanded by the CHANNEL MODE MODIFY is different from the one used by the mobile station or whether it is already in use.

3.4.6.1.3 Abnormal cases

If the new mode is multi-rate speech codec and if the MultiRate Configuration IE is inconsistent, the MS shall ignore the CHANNEL MODE MODIFY message and shall not send CHANNEL MODE MODIFY ACKNOWLEDGE message to the network.

No other specific action for a lower layer failure is specified in this clause. If the mobile station does not support the indicated mode, it shall retain the old mode and return the associated channel mode information in the CHANNEL MODE MODIFY ACKNOWLEDGE message.

3.4.6.2 Channel mode modify procedure for a voice group call talker

3.4.6.2.1 Initiation of the channel mode modify procedure

The network initiates the procedure by sending a CHANNEL MODE MODIFY message to the mobile station. This message contains:

- a channel description of the channel on which the CHANNEL MODE MODIFY message is sent; and
- the new channel mode to be used on the channel; and
- optionally, the VGCS target mode information element defining which RR mode is to be used with the new channel mode (i.e. dedicated mode or group transmit mode). If this information element is not present, the RR mode shall be assumed to be the same as with the previous channel mode. The VGCS target mode information element shall also indicate the group cipher key number for the group cipher key to be used on the new channel or if the new channel is non ciphered. If the information element is not present, the ciphering mode and ciphering key shall be the same as with the previous channel mode. Mobile stations not supporting VGCS talking shall ignore the CHANNEL MODE MODIFY message if the VGCS target mode information element is included in the message and shall send an RR STATUS message to the network with cause #96.

The start of ciphering with a group cipher key with the new channel mode is only possible when the mode on the old channel was not ciphered.

If a VGCS target mode information element indicating a group cipher key number is included in the message and the previous mode is not non ciphered and the group cipher key number is different to the previous cipher key number, the mobile station shall behave as if it would not support the indicated channel mode.

3.4.6.2.2 Completion of mode change procedure

When it has received the CHANNEL MODE MODIFY message, the mobile station changes the mode for the indicated channel and then replies by a CHANNEL MODE MODIFY ACKNOWLEDGE message indicating the new channel mode.

3.4.6.2.3 Abnormal cases

No specific action for a lower layer failure is specified in this clause. If the mobile station does not support the indicated mode, it shall retain the old mode and return the associated channel mode information in the CHANNEL MODE MODIFY ACKNOWLEDGE message.

3.4.7 Ciphering mode setting procedure

In dedicated mode, the ciphering mode setting procedure is used by the network to set the ciphering mode, i.e. whether or not the transmission is ciphered, and if so which algorithm to use. The procedure shall only be used to change from

"not ciphered" mode to "ciphered" mode, or vice-versa, or to pass a CIPHERING MODE COMMAND message to the mobile station while remaining in the "not ciphered" mode. The ciphering mode setting procedure is always triggered by the network and it only applies to dedicated resources.

The cipher mode setting procedure shall not be applied in group transmit mode.

3.4.7.1 Ciphering mode setting initiation

The network initiates the ciphering mode setting procedure by sending a CIPHERING MODE COMMAND message to the mobile station on the main signalling link, indicating whether ciphering shall be used or not, and if yes which algorithm to use.

Additionally, the network may, by the use of the cipher response information element, request the mobile station to include its IMEISV in the CIPHERING MODE COMPLETE message.

The new mode is applied for reception on the network side after the message has been sent.

3.4.7.2 Ciphering mode setting completion

Whenever the mobile station receives a valid CIPHERING MODE COMMAND message, it shall, if a SIM is present and considered valid by the ME and the ciphering key sequence number stored on the SIM indicates that a ciphering key is available, load the ciphering key stored on the SIM into the ME. A valid CIPHERING MODE COMMAND message is defined to be one of the following:

- one that indicates "start ciphering" and is received by the mobile station in the "not ciphered" mode;
- one that indicates "no ciphering" and is received by the MS in the "not ciphered" mode; or
- one that indicates "no ciphering" and is received by the mobile station in the "ciphered" mode.

Other CIPHERING MODE COMMAND messages shall be regarded as erroneous, an RR STATUS message with cause "Protocol error unspecified" shall be returned, and no further action taken.

Upon receipt of the CIPHERING MODE COMMAND message indicating ciphering, the mobile station shall start transmission and reception in the indicated mode.

When the appropriate action on the CIPHERING MODE COMMAND has been taken, the mobile station sends back a CIPHERING MODE COMPLETE message. If the "cipher response" field of the cipher response information element in the CIPHERING MODE COMMAND message specified "IMEI must be included" the mobile station shall include its IMEISV in the CIPHERING MODE COMPLETE message.

Upon receipt of the CIPHERING MODE COMPLETE message or any other correct layer 2 frame which was sent in the new mode, the network starts transmission in the new mode.

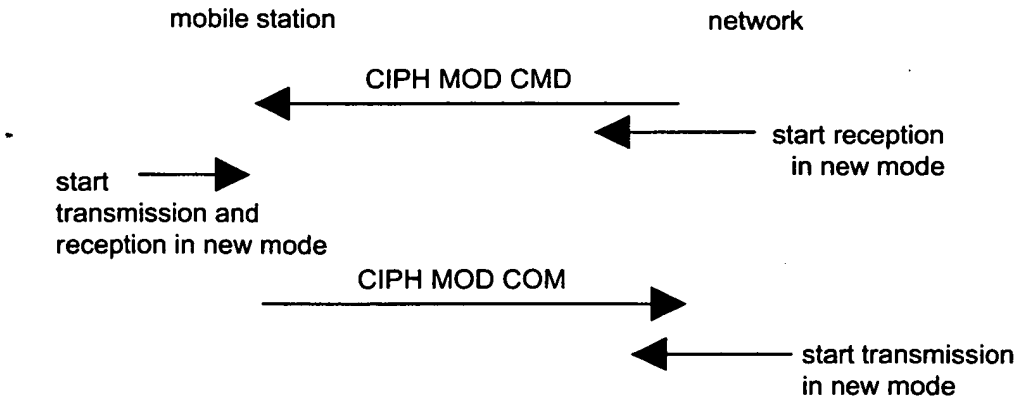

Figure 3.4.7.2.1/3GPP TS 04.18: Ciphering mode setting sequence

3.4.8 Additional channel assignment procedure

NOTE: In the present state of 3GPP TS 04.03, this procedure is only possible for the TCH/H + ACCHs to TCH/H + TCH/H + ACCHs transition. As a consequence it is not needed for simple mobile stations. The description of the procedure is in general terms to cope with possible evolution.

In dedicated mode, a change of channel configuration to include an additional channel can be requested by upper layers.

The additional channel assignment procedure shall not be applied in group transmit mode,

The purpose of the additional assignment procedure is to allocate an additional dedicated channel to a mobile station while keeping the previously allocated channels. In particular the main DCCH and the SACCH are not modified, and signalling exchanges are not interrupted.

The additional assignment procedure may happen only in dedicated mode. It is used for instance for the transition from the TCH/H + ACCHs configuration to the TCH/H + TCH/H + ACCHs configuration.

The additional assignment procedure is always initiated by the network.

3.4.8.1 Additional assignment procedure initiation

The network initiates the procedure by sending an ADDITIONAL ASSIGNMENT message to the mobile station on the main DCCH. The ADDITIONAL ASSIGNMENT message contains the description of the newly assigned channel.

On receipt of the message, the mobile station activates the new channel.

3.4.8.2 Additional assignment procedure completion

The mobile station sends an ASSIGNMENT COMPLETE message to the network on the channel, on which it receives the ADDITIONAL ASSIGNMENT message.

3.4.8.3 Abnormal cases

A lower layer failure occurring during the procedure is treated according to the general case (see clause 3. 4.13.2).

The network considers the channel as allocated from the sending of the ADDITIONAL ASSIGNMENT message. As a consequence, if a re-establishment occurs, the network will consider the context as if the mobile station has received the message, and the new configuration allocated after the re-establishment may differ from the one the mobile station had before the re-establishment.

3.4.9 Partial channel release procedure

In dedicated mode, a change of channel configuration to release one channel can be requested by upper layers.

The partial channel release procedure shall not be applied in group transmit mode.

The purpose of this procedure is to deactivate part of the dedicated channels in use. The channel configuration remains dedicated.

NOTE: In the present state of 3GPP TS 04.03, this procedure is only possible for the TCH/H + TCH/H + ACCHs to TCH/H + ACCHs transition. As a consequence it is not needed for simple mobile stations.

The partial release procedure is always initiated by the network.

3.4.9.1 Partial release procedure initiation

The network initiates the partial release by sending a PARTIAL RELEASE message to the mobile station on the main DCCH.

On receipt of the PARTIAL RELEASE message the mobile station:

- Initiates the disconnection of all the link layer connections carried by the channel to be released;

- Simultaneously initiates the connection on remaining channels of the data link layer connections that have been released;
- Deactivates the physical channels to be released.
- Sends a PARTIAL RELEASE COMPLETE to the network on the (possibly new) main signalling link.

3.4.9.2 Abnormal cases

A lower layer failure is treated following the general rules as specified in clause 3.4.13.2.

Moreover, on the network side, the channel configuration nature is set from the sending of the PARTIAL RELEASE message onward. As a consequence, any new assignment after a re-establishment may concern a different channel configuration nature from the one known by the mobile station before the re-establishment.

3.4.10 Classmark change procedure

In dedicated mode or in group transmit mode, this procedure allows the mobile station to indicate to the network a change of characteristics reflected in the classmark (e.g. due to addition of power amplification). Furthermore, a mobile station which implements the « controlled early classmark sending » option may also send a CLASSMARK CHANGE message and/or a UTRAN CLASSMARK CHANGE message and/or a CDMA2000 CLASSMARK CHANGE message as described in clause 3.3.1.1.4.1, even if no change of characteristics has occurred.

The mobile station sends a CLASSMARK CHANGE message to the network. This message contains the new mobile station classmark 2 information element. It may also contain a Classmark 3 Information Element. There is no acknowledgement from the network at layer 3.

A UTRAN capable MS, indepently of sending a CLASSMARK CHANGE message, sends a UTRAN CLASSMARK CHANGE message to the network. This message contains the INTER RAT HANDOVER INFO defined in 3GPP TS 25.331 There is no acknowledgement from the network at layer 3.

NOTE: For the network, UTRAN predefined configuration status information may be invalid if the PLMN where predefined configurations were read and the PLMN of the connected cell do not use common predefined configurations.

If the CLASSMARK CHANGE and one or more of these additional messages are to be sent by the MS, the CLASSMARK CHANGE message shall be sent first.

3.4.11 Classmark interrogation procedure

This procedure allows the network to request additional classmark information from the mobile station (e.g. if the information initially sent by the mobile station is not sufficient for network decisions). For a multi-RAT MS this procedure allows in addition the network to request INTER RAT HANDOVER INFO or CDMA2000 MS Capability information..

3.4.11.1 Classmark interrogation initiation

The network initiates the classmark interrogation procedure by sending a CLASSMARK ENQUIRY message to the mobile station on the main DCCH.

3.4.11.2 Classmark interrogation completion

On receipt of the CLASSMARK ENQUIRY message the mobile station sends a CLASSMARK CHANGE and/or a UTRAN CLASSMARK CHANGE and/or a CDMA2000 CLASSMARK CHANGE message to the network on the main DCCH. The Classmark Enquiry Mask information element in the CLASSMARK ENQUIRY message indicates the type of request. If the Classmark Enquiry Mask information element is not included in the CLASSMARK ENQUIRY message, this indicates a request for CLASSMARK CHANGE message.

The CLASSMARK CHANGE message contains the mobile station classmark 2 information element. It may also contain a Classmark 3 Information Element.

The UTRAN CLASSMARK CHANGE message contains the INTER RAT HANDOVER INFO (UTRAN specific information).

The CDMA2000 CLASSMARK CHANGE message contains CDMA2000 UE capability information.

If the CLASSMARK CHANGE and one or more of these additional messages are to be sent by the MS, the CLASSMARK CHANGE message shall be sent first.

3.4.12 Indication of notifications and paging information

Only applicable for mobile stations supporting VGCS or VBS:

In dedicated mode or in group transmit mode, the RR entity shall provide indications to the upper layer on all received notifications for voice group calls or voice broadcast calls according to the VGCS or VBS subscription data stored in the mobile station. The indication shall include the notified group or broadcast call reference and possibly the related priority, if provided.

In group transmit mode, if the mobile station has decoded a paging message with the own mobile station identity on the PCH or on the voice group call channel downlink, the RR entity shall provide an indication to the upper layers, together with the related priority, if applicable.

In group transmit mode, if the RR entity receives information on the voice group call channel of the existence of a paging message in its paging subgroup of the PCH, the RR entity shall pass this information to the upper layers together with the related priority if provided (see also clause 3.3.2 and 3.3.3).

3.4.13 RR connection release procedure

3.4.13.1 Normal release procedure

The release of the RR connection can be requested by upper layers.

The purpose of this procedure is to deactivate all the dedicated channels in use. When the channels are released and the mobile station is not IMSI attached for GPRS services (clause 4), the mobile station returns to the CCCH configuration, idle mode.

If the mobile station is IMSI attached for GPRS services the following three cases apply:

- If the mobile station has no radio resources (i.e., no temporary block flow) allocated on a PDCH, the mobile station returns to the PCCCH or CCCH configuration, packet idle mode.
- If the mobile station is operating in dual transfer mode when the RR connection is released, the radio resources allocated on a PDCH are released, the mobile station returns to the PCCCH or CCCH configuration, packet idle mode.
- Otherwise, if the mobile station has radio resources allocated on a PDCH, the mobile station enters packet transfer mode.

The channel release procedure can be used in a variety of cases, including TCH release after a call release, and DCCH release when a dedicated channel allocated for signalling is released.

In dedicated mode and group transmit mode, the channel release procedure is always initiated by the network.

3.4.13.1.1 Channel release procedure initiation in dedicated mode and in group transmit mode

The network initiates the channel release by sending a CHANNEL RELEASE message to the mobile station on the main DCCH, starts timer T3109 and deactivates the SACCH.

On receipt of a CHANNEL RELEASE message the mobile station starts timer T3110 and disconnects the main signalling link. When T3110 times out, or when the disconnection is confirmed, the mobile station deactivates all channels, considers the RR connection as released, and returns to CCCH idle mode, returns to PCCCH or CCCH packet idle mode or enters packet transfer mode.

NOTE: Data Links other than the main signalling link are disconnected by local end link release.

If case of dedicated mode, on the network side, when the main signalling link is disconnected, the network stops timer T3109 and starts timer T3111. When timer T3111 times out, the network deactivates the channels, they are then free to be allocated to another connection.

NOTE: The sole purpose of timer T3111 is to let some time to acknowledge the disconnection and to protect the channel in case of loss of the acknowledge frame.

If timer T3109 times out, the network deactivates the channels; they are then free to be allocated to another connection.

The CHANNEL RELEASE message will include an RR cause indication as follows:

#0: if it is a normal release, e.g. at the end of a call or at normal release of a DCCH.

#1: to indicate an unspecified abnormal release.

#2, #3 or #4: to indicate a specific release event.

#5: if the channel is to be assigned for servicing a higher priority call (e.g. an emergency call).

#65: if e.g. a handover procedure is stopped because the call has been cleared.

The CHANNEL RELEASE message may include the information element BA Range which may be used by a mobile station in its selection algorithm (see 3GPP TS 05.08 and 3GPP TS 23.022).

Mobile stations not supporting VGCS or VBS listening shall consider Group Channel Description and Group Cipher Key Number information elements as unnecessary in the message and perform the channel release procedure as normal.

For mobile stations supporting VGCS listening, the following procedures apply:

The CHANNEL RELEASE message may include the information element Group Channel Description. In this case, the mobile station shall release the layer 2 link, enter the group receive mode and give an indication to the upper layer. If a CHANNEL RELEASE message with no Group Channel Description is received, the normal behaviour applies.

If ciphering is applied on the VGCS or VBS channel, the network shall provide in the CHANNEL RELEASE message with the Group Cipher Key Number information element for the group cipher key to be used by the mobile station for reception of the VGCS or VBS channel. If this information element is not included, no ciphering is applied on the VGCS or VBS channel.

A mobile station not supporting the « GPRS » option shall consider the GPRS Resumption information element as an information element unknown in the CHANNEL RELEASE message and perform the RR connection release procedure as normal.

For a mobile station supporting the « GPRS » option, the following additional procedures also apply:

- The CHANNEL RELEASE message may include the information element GPRS Resumption. If the GPRS Resumption information element indicates that the network has resumed GPRS services, the RR sublayer of the mobile station shall indicate a RR GPRS resumption complete to the MM sublayer, see clause 4. If the GPRS Resumption information element indicates that the network has not successfully resumed GPRS services, the RR sublayer of the mobile station shall indicate a RR GPRS resumption failure to the MM sublayer, see clause 4.

- If the mobile station has performed the GPRS suspension procedure (clause 3.3.1.1.4.2) and the GPRS Resumption information element is not included in the message, the RR sublayer of the mobile station shall indicate a RR GPRS resumption failure to the MM sublayer, see clause 4.

- If the mobile station has not performed the GPRS suspension procedure and the GPRS Resumption information element is not included in the message, the mobile station shall perform the RR connection release procedure as normal.

3.4.13.1.2 Abnormal cases

Abnormal cases are taken into account in the main part of the description of the procedure.

3.4.13.2 Radio link failure in dedicated mode or dual transfer mode

The main part of these procedures concerns the "normal" cases, i.e. those without any occurrence of loss of communication means. A separate paragraph at the end of the description of each procedure treats the cases of loss of communication, called a radio link failure. In dedicated mode, in most of the cases the reaction of the mobile station or the network is the same. Those reactions are described in this clause to avoid repetitions.

A radio link failure can be detected by several ways:

1) By analysis of reception at layer 1, as specified in 3GPP TS 05.08 and clause 3.4.1.1.

2) By a data link layer failure as specified in 3GPP TS 04.06, on the main signalling link. A data link failure on any other data link shall not be considered as a radio link failure.

3) When a lower layer failure happens while the mobile station attempts to connect back to the old channels in a channel assignment procedure, handover procedure, PDCH assignment procedure, RR-cell change order procedure or DTM assignment procedure with relocation of the RR connection.

4) In some cases where timers are started to detect the lack of answer from the other party, as described in clause 3.

The two first cases are known by the term "lower layer failure".

3.4.13.2.1 Mobile side

When a radio link failure is detected by the mobile station,

- the MS shall perform a local end release on all signalling links unless otherwise specified;
- the mobile station shall deactivate all dedicated channels;
- if the mobile station is in dual transfer mode, it shall abort the packet resources;
- the RR sublayer of the mobile station shall indicate an RR connection failure to the MM sublayer unless otherwise specified.

NOTE: Upper layers may decide on a re-establishment (cf. clause 5.5.4).

When a mobile station which has performed the GPRS suspension procedure (clause 3.3.1.1.4.2) detects a radio link failure, the RR sublayer of the mobile station shall indicate a RR GPRS resumption failure to the MM sublayer, see clause 4.

3.4.13.2.2 Network side

In dedicated mode, the reaction of the network to a lower layer failure depends on the context. Except when otherwise specified, it is to release the connection either with the channel release procedure as specified in clause 3.5.1, or with the following procedure. The network starts timer T3109 and deactivates the SACCH (and hence to stop transmission on the SACCH). If the mobile station is in dual transfer mode, the network also aborts all the allocated packet resources.

When a radio link failure has been detected, an indication is passed to the upper Mobility Management sublayer on the network side.

When timer T3109 expires, the network can regard the channels as released and free for allocation.

This procedure relies on the fact that if a mobile station does not receive the SACCH for some time, it completely releases the channels (cf. 3GPP TS 05.08).

NOTE: The network should maintain for a while the transaction context in order to allow call re-establishment. The length of timer is for further study.

When a mobile station which has performed the GPRS suspension procedure (clause 3.3.1.1.4.2) detects a radio link failure, the RR sublayer of the mobile station shall indicate a RR GPRS resumption failure to the MM sublayer, see clause 4.

3.4.13.3 RR connection abortion in dedicated mode or dual transfer mode

The mobile station aborts the RR connection by initiating a normal release of the main signalling link, performing local end releases on all other signalling links, disconnecting all traffic channels, if any, and aborting all the packet resources, if any.

When a mobile station which has performed the GPRS suspension procedure (clause 3.3.1.1.4.2) aborts the RR connection, the RR sublayer of the mobile station shall indicate a RR GPRS resumption failure to the MM sublayer, see clause 4.

3.4.13.4 Uplink release procedure in group transmit mode

If the uplink release is requested by the upper layer the mobile station shall send an UPLINK RELEASE message on the voice group call channel uplink, perform a release of the main signalling link and go back to the group receive mode.

If the UPLINK RELEASE message is received from the network on the voice group call channel downlink, the MS shall perform a release of the main signalling link and go back to the group receive mode.

3.4.13.5 Radio link failure in group transmit mode

The main part of these procedures concerns the "normal" cases, i.e. those without any occurrence of loss of communication means. A separate paragraph at the end of the description of each procedure treats the cases of loss of communication, called a radio link failure. In group transmit mode, in most of the cases the reaction of the mobile station or the network is the same. Those reactions are described in this clause to avoid repetitions.

A radio link failure can be detected by several ways:

1) By analysis of reception at layer 1, as specified in 3GPP TS 05.08 and clause 3.4.1.1.

2) By a data link layer failure as specified in 3GPP TS 04.06, on the main signalling link. A data link failure on any other data link shall not be considered as a radio link failure.

3) When a lower layer failure happens while the mobile station attempts to connect back to the old channels in a channel assignment procedure or handover procedure.

4) In some cases where timers are started to detect the lack of answer from the other party, as described in clause 3.

The two first cases are known by the term "lower layer failure".

3.4.13.5.1 Mobile side

When a radio link failure is detected by the mobile station,

- the MS shall perform a local end release on all signalling links;
- the mobile station shall go back to idle mode and, when possible, to group receive mode;
- the RR sublayer of the mobile station shall indicate an RR connection failure to the MM sublayer unless otherwise specified.

3.4.13.5.2 Network side

When the uplink has been allocated and the network detects a lower layer failure, the network shall set the uplink free and provide an UPLINK FREE message on the main signalling channel, when appropriate.

When a radio link failure has been detected, an indication is passed to the upper Mobility Management sublayer on the network side.

3.4.14 Receiving a RR STATUS message by a RR entity.

If the RR entity of the mobile station receives a RR STATUS message no transition and no specific action shall be taken as seen from the radio interface, i.e. local actions are possible.

The actions to be taken on receiving a RR STATUS message in the network are an implementation dependent option see also clause 8.

3.4.15 Group receive mode procedures

Only applicable for support of VGCS listening or VBS listening.

3.4.15.1 Mobile station side

3.4.15.1.1 Reception of the VGCS or VBS channel

In group receive mode, the mobile station receives the downlink of the voice broadcast channel or voice group call channel for which the channel description was provided within the notification message or in the related command message. The mobile station should also listen to the CCCH of the serving cell. Moreover, it measures the received levels on the serving cell and on the neighbour cells to assess the need for a cell reselection as specified in 3GPP TS 05.08. The general cell reselection procedure for the mobile station in group receive mode is described in 3GPP TS 23.022.

Information on neighbour cells used for cell reselection and reception of the VGCS or VBS channel in the neighbour cells may be provided on the downlink messages (see clause 3.4.15.1.2). If no such information is provided or information is missing, the mobile station shall try to read this information on the BCCH and NCH of the neighbour cells.

3.4.15.1.2 Monitoring of downlink messages and related procedures

Mobile stations in group receive mode shall monitor messages related to the following procedures on the VGCS or VBS channel downlink and act appropriately in order to be able to keep receiving the VGCS or VBS channel downlink.

All messages for mobile stations in group receive mode shall be sent in UI format on the VGCS or VBS channel downlink. Mobile stations in group receive mode shall ignore all messages which are not sent in UI format or which are not related to the following mentioned procedures.

The mobile should also monitor messages on the PCH or NCH of the current cell.

3.4.15.1.2.1 (void)

3.4.15.1.2.2 (void)

3.4.15.1.2.3 Channel mode modify procedure

The mobile station shall receive CHANNEL MODE MODIFY messages. The mobile station shall use the new channel mode but shall not transmit any response to the network.

3.4.15.1.2.4 Notification and paging information

The mobile station shall monitor messages related to notification and paging procedures.

The RR entity shall provide indications on all received notifications for voice group calls or voice broadcast calls to the upper layer. The indication shall include the notified group or broadcast call reference and, if provided, and if the mobile station supports eMLPP the related priority.

On request by the upper layer to join another voice broadcast call or voice group call for which a corresponding notification has been received on the VGCS or VBS channel downlink, the RR entity shall read the corresponding notification on the NCH.

If the mobile station has received a paging message with its own mobile station identity on the PCH or on the voice broadcast channel or voice group call channel downlink, the RR entity shall provide an indication to the upper layers, together with the related priority, if applicable.

3.4.15.1.2.4.1 Use of Reduced NCH monitoring

This clause applies to mobile stations which are in group receive mode or group transmit mode of dedicated mode and which in addition want to receive notification messages for other voice broadcast calls or voice group calls and which aim at reducing the reception load.

If the reduced NCH monitoring mechanism is used on the NCH as defined in clause 3.3.3.3, when the MS in group receive mode or group transmit mode enters a cell, it should read the NCH until it has received at least two messages on the NCH indicating NLN, with the two last received NLN being identical. Then it should stop reading the NCH until it receives on the SACCH an NLN(SACCH) different from the last previously received NLN.

For this, a parameter is provided on the SACCH in the SYSTEM INFORMATION TYPE 6 message:

- NLN(SACCH): Notification List Number (received on the SACCH).

If a mobile station receives on the SACCH an NLN(SACCH) different from the last received NLN it may read the NCH until it has received at least two messages on the NCH indicating NLN with the two last received NLN being identical.

If a message in the SACCH is not received correctly the MS may read the NCH until it has received at least two messages on the NCH indicating NLN, with the two last received NLN being identical.

NOTE: If the NLN(SACCH) is not provided on the SACCH, the mobile station, depending on its particular implementation, may either read the NCH while being in group receive mode or group transmit mode or may not be able to receive notifications for other voice group calls or voice broadcast calls other than those notifications provided on the FACCH.

3.4.15.1.2.5 Uplink status messages

Mobile stations supporting VGCS talking shall monitor the VGCS uplink control related messages UPLINK FREE and UPLINK BUSY.

3.4.15.1.2.6 Channel release message

The mobile station shall receive CHANNEL RELEASE messages. On receipt of a CHANNEL RELEASE message, the RR entity shall go to idle mode and give an indication to the upper layer. (See also clause 3.4.15.1.4.1, 4th paragraph.)

3.4.15.1.2.7 Information on paging channel restructuring

On receipt of a SYSTEM INFORMATION TYPE 6 message indicating that paging channel restructuring has taken place, if the mobile station wants to be able to read its paging subchannel while in group receive mode or group transmit mode, the mobile station should read the related messages on the BCCH to know the position of its paging group.

3.4.15.1.3 Uplink reply procedure

In Group Receive mode, on receipt of an UPLINK FREE message with an uplink access request indication from the network on the voice group call channel downlink, the mobile station shall send two UPLINK ACCESS messages on the voice group call channel with establishment cause "Reply on uplink access request" and then stop immediately transmitting on the uplink.

The first UPLINK ACCESS message shall be transmitted by the mobile station with a random delay between 0 and 20 ms. The second UPLINK ACCESS messages shall be repeated after a further period of 100 ms plus a random delay between 0 and 20 ms.

If an uplink identity code (UIC) of the current cell has been provided by the network in the UPLINK FREE message, the mobile station shall use this UIC for the coding of the UPLINK ACCESS messages. If no UIC is provided, the mobile station shall use the BSIC received of the serving cell, for instance as received from the initial synchronization.

3.4.15.1.4 Leaving the group receive mode

3.4.15.1.4.1 Returning to idle mode

If the mobile station enters a new cell in which:

- notifications for the current group or broadcast call are sent; but
- no VGCS or VBS channel description for the current group or broadcast call is provided;

the mobile station shall go to idle mode and give an indication to the upper (sub-)layers.

NOTE: Upper (sub-)layers then can request the establishment of an RR connection in order to be informed about the channel description by the network.

If the mobile station enters a cell in which notifications for the current group or broadcast call are not sent, the mobile station shall disconnect locally the TCH, go to idle mode and give an indication to the upper (sub-)layers.

On request by the upper layer in order to respond to a paging message the RR entity shall go to the idle mode in order to establish a dedicated RR connection.

On receipt of a CHANNEL RELEASE message in UI format from the network the RR entity shall go to idle mode and give an indication to the upper layer.

If the upper layer requests to abort the group receive mode, the mobile station shall go back to idle mode.

3.4.15.1.4.2 Going to group transmit mode

Only applicable for mobile stations supporting VGCS talking.

If the upper layer requests an uplink access, the mobile station shall perform the uplink investigation procedure as defined in clause 3.3.1.2.1.1.

If the uplink investigation procedure is not successful, the mobile station shall give an indication to the upper layers and remain in group receive mode.

If the uplink investigation procedure is successful, the uplink access procedure is initiated as defined in clause 3.3.1.2.1.2.

If the uplink access procedure is successful, the mobile station shall give an indication to the upper layers and enter the group transmit mode.

If the uplink access procedure is not successful, the mobile station shall give an indication to the upper layers and remain in group receive mode.

3.4.15.2 Network side

3.4.15.2.1 Provision of messages on the VGCS or VBS channel downlink

3.4.15.2.1.1 General

The network shall provide all messages directed to mobile stations in group receive mode (see clause 3.4.15.1.2) in unacknowledged mode. Those messages which are also sent to the mobile station in group transmit mode in acknowledged mode have therefore to be repeated in addition as UI messages on the VGCS channel downlink if they shall also be received by mobile stations in group receive mode.

3.4.15.2.1.2 Provision of general information messages

In the case where the group call area exceeds one cell, the network should provide the SYSTEM INFORMATION TYPE 6 message on the SACCH related to the voice broadcast channel or voice group call channel.

In addition, if the group call area exceeds one cell, the network should provide SYSTEM INFORMATION TYPE 5 (possibly together with TYPE 5bis and 5ter) on the SACCH related to the voice broadcast channel or voice group call channel.

- The SYSTEM INFORMATION TYPE 5, TYPE 5bis and TYPE 5ter messages provide information on the BCCH frequency of the neighbour cells.
- The SYSTEM INFORMATION TYPE 6 message provides information on the location area of the current cell, possibly the status of the NCH, and an indication of whether paging channel restructuring has taken place.

- $(ASCI)$ Optional messages of the SYSTEM INFORMATION TYPE 10 message type provide information improving cell re-selection in group receive mode.

The network may also provide layer 3 messages for notification on the VGCS or VBS channel downlink FACCH.

3.4.15.2.1.3 Provision of messages related to the voice group call uplink channel

Only applicable for the support of VGCS talking.

The network shall provide UPLINK FREE messages on the main signalling link of all voice group call channels when the uplink is set free. The provision of UPLINK FREE messages shall be repeated as long as no uplink is granted to a mobile station.

The network shall provide an UPLINK BUSY message on the main signalling link of all voice group call when the uplink has been granted to a mobile station.

The network may send UPLINK FREE messages containing an uplink access request on the main signalling channel of the VGCS channels in order to obtain knowledge on whether any listening mobile is present in a cell or not. If there is no mobile station responding to the uplink access request, the network may decide to clear the VGCS channel in that cell.

3.4.15.2.2 Release of the VGCS or VBS Channels

If a release request for a voice group call is received from the upper layer, the network, after having released the RR connection with the mobile station in group transmit mode, shall stop the notification procedures for that voice group call and clear all related voice group call channels.

If a release request for a voice broadcast call is received from the upper layer, the network shall stop the notification procedures for that voice broadcast call and locally disconnect any channel related to the voice broadcast call.

3.4.15.3 Failure cases

If the mobile station looses the voice group call channel or voice broadcast channel, the mobile station shall search all possible channel positions on the current cell and the neighbour cells for which a channel description is known for that call.

3.4.16 Configuration change procedure

This is only applicable for multislot configuration. This message shall not be used to change a non-multislot configured channel to a multislot configured channel.

The configuration change procedure is used by the network to change the number of timeslots used in a multislot configuration. The procedure can also be used to change the channel mode of one or several channels and change their allocation. The main signalling link however, cannot be changed by the configuration change procedure. If a change of the main signalling link is needed, the assignment or handover procedures shall be used.

The network shall not initiate a new configuration change procedure before a response to the previous CONFIGURATION CHANGE COMMAND message has been received from the mobile station.

3.4.16.1 Configuration change initiation

The procedure starts when the network sends a CONFIGURATION CHANGE COMMAND to the mobile station on the main DCCH. The message indicates:

- which timeslots to use in uplink;
- which timeslots to use in downlink; and
- which channel set each timeslot belongs to.

The message may also contain definitions of the channel mode to be applied for one or several channel sets. If a previously undefined channel set is defined by the CONFIGURATION CHANGE COMMAND a definition of the channel mode for the new channel set shall be included in the message.

3.4.16.2 Configuration change completion

When the mobile station receives the CONFIGURATION CHANGE COMMAND it changes its configuration in accordance with the message contents and returns a CONFIGURATION CHANGE ACKNOWLEDGE on the same channel as the command message was received, confirming the new channel configuration. This applies irrespective of whether the new configuration is different from the one already in use by the mobile station or if it is the same.

3.4.16.3 Abnormal cases

If the CONFIGURATION CHANGE COMMAND message instructs the mobile station to use a Channel Configuration or Mode(s) that it does not support, or if the channel mode to use is not defined for all channel sets, the mobile station shall return a CONFIGURATION CHANGE REJECT message with cause 'channel mode unacceptable', and the mobile station shall remain on the current channel(s) and use the old Channel Configuration and Channel Mode(s).

3.4.17 Mapping of user data substreams onto timeslots in a multislot configuration

For multislot configurations the following rules for mapping of the user data substreams onto timeslots shall apply for each channel set:

- at initial assignment (using assignment procedure), the lowest numbered user data substream shall be mapped to the lowest numbered timeslot etc. in ascending order (the user data substreams are numbered 0 to (n-1), where n is the number of substreams)
- at channel changes using handover procedure or assignment procedure (where none of the timeslots are present in both the old and the new configuration), the lowest numbered user data substream shall be mapped to the lowest numbered timeslot etc. in ascending order (the user data substreams are numbered 0 to (n-1), where n is the number of substreams)
- at channel changes using assignment procedure (where at least one of the timeslots is the same in both the old and the new configuration) or configuration change procedure:
  - user data substream(s) mapped to timeslot(s) that are present in both the old and the new configuration shall continue to be mapped to the same timeslot(s) as before the channel change; and
  - possibly added timeslot(s) shall carry the lowest numbered available user data substream so that the lowest numbered data substream among the added is mapped to the lowest numbered added timeslot and so on in ascending order.

NOTE: The user data substream number is a number that need not be the same as the inband number used for transparent services. The user data substream number is only used as a point of reference to a specific user data substream.

3.4.18 Handling of classmark information at band change

The coding of some fields in the *Mobile Station Classmark 1* and in the *Mobile Station Classmark 2* information elements depends on the band in use as described in clause 10.5.1.5 and clause 10.5.1.6. When a command to change the frequency band (GSM 900, DCS 1800) has been received (by, e.g., an IMMEDIATE ASSIGNMENT message, an ASSIGNMENT COMMAND message, a HANDOVER COMMAND message or a FREQUENCY REDEFINITION message) the following applies:

- When an IMMEDIATE ASSIGNMENT message is received, "the band used" for the purpose of coding the classmark information in the service request message, see clause 3.1.5, shall be understood as the band used for the CHANNEL REQUEST message or (one of) the band(s) indicated by the IMMEDIATE ASSIGNMENT message.
- For other cases "the band used" for the purpose of coding the classmark information shall be understood as one of the bands used or attempted to be used within the 2 seconds preceding the passing of the layer 3 message containing the classmark information to the layer 2 send queue as described in 3GPP TS 04.06.

NOTE: This definition means that when a band change is being done the network must take appropriate actions to handle possible ambiguities in the frequency band related information in the classmark.

3.4.19 Assignment to a Packet Data channel

This clause is only applicable to mobile stations supporting the <<GPRS>> option.

When in dedicated mode or in group transmit mode, the network may wish to change the resources used by a mobile station that supports the <<GPRS option>>. This change may be performed through the assignment to a Packet Data Channel procedure.

The purpose of the assignment to PDCH channel procedure is to completely modify the physical channel configuration of the mobile station without frequency redefinition or change in synchronization while staying in the same cell.

The assignment to PDCH procedure only commences in dedicated mode or in group transmit mode. This procedure cannot be used in the idle mode.

The assignment to PDCH procedure includes:

- the suspension of normal operation;
- the release of the main signalling link, and of the other data links as defined in clause 3.1.4, and the disconnection of TCHs if any;
- the deactivation of previously assigned channels (layer 1);
- The triggering of the establishment of a Temporary Block Flow.

The assignment to PDCH procedure is always initiated by the network.

3.4.19.1 Assignment to PDCH initiation

The network initiates the assignment to PDCH procedure by sending a PDCH ASSIGNMENT COMMAND message to the mobile station on the main signalling link. It then starts timer T3117.

NOTE: The network should take into account limitations of certain mobile stations to understand formats used in the Frequency List IE and Cell Channel Description IE used in the PDCH ASSIGNMENT COMMAND message, see clause 10.5.2.13 and clause 10.5.2.1b.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases is suspended until resumption is indicated. These RR messages can be deduced from clauses 3.4.3 and 8.8 Radio Resource management.

Upon receipt of the PDCH ASSIGNMENT COMMAND message, the mobile station initiates a local end release of dedicated mode link layer connections, disconnects the physical channels, commands the switching to the identified channels and obeys the procedures relevant to the establishment of the Temporary Block Flow. The mobile station starts timer T3190.

The PDCH ASSIGNMENT COMMAND message contains the description of either the uplink TBF or the downlink TBF.

The information on the power to be used on the target TBF shall not affect the power used on the old channel(s).

A PDCH ASSIGNMENT COMMAND message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions.

In the case of the reception of a PDCH ASSIGNMENT COMMAND message which contains only the description of a TBF to be used after the starting time, the mobile station shall wait up to the starting time before using the TBF. If the starting time has already elapsed, the mobile shall use the TBF as an immediate reaction to the reception of the message (see 3GPP TS 05.10 for the timing constraints).

If the message contains both the description of a TBF to be used after the indicated time and of a TBF to be used before, the mobile station uses the TBF as an immediate reaction to the reception of the message. If the moment the mobile station is ready to access is before the indicated time, the mobile station uses the TBF described for before the starting time. The mobile station then changes to the TBF described for after the starting time at the indicated time. New parameters can be frequency list, MAIO and HSN. Other parameters describing the allocated channels shall be identical to the parameters described for before the starting time. If the moment the mobile station is ready to access is after the starting time, the mobile station uses the TBF described for after the starting time.

If frequency hopping is applied, the cell allocation if present in the message is used to decode the mobile allocation. If the cell allocation is not included, the mobile station uses its current cell allocation, the current CA is the last CA received on the BCCH. Afterward, the current CA may be changed by some messages sent on the main signalling link containing a CA (the possible messages are: ASSIGNMENT COMMAND, HANDOVER COMMAND and FREQUENCY REDEFINITION). Note that there are cases in which the current CA is undefined, see clause 3.4.3.3.

The PDCH ASSIGNMENT COMMAND does not contain a cipher mode setting IE. Any RR layer ciphering that may have been applied in dedicated mode shall not be applied to the target TBF.

3.4.19.2 Completion of the Assignment to PDCH procedure

The network regards the procedure as successfully completed when RLC/MAC blocks are received from the mobile station on the target TBF. The network then stops timer T3117.

The mobile station regards the procedure as successfully completed when RLC/MAC blocks with any TFI are received on the new PDCH.

3.4.19.3 Abnormal cases

If the mobile station has no current CA and if it needs a CA to analyse the PDCH ASSIGNMENT COMMAND message, it stays on the current channel(s) and sends an ASSIGNMENT FAILURE message with cause "no cell allocation available".

If the PDCH ASSIGNMENT COMMAND message instructs the mobile station to use a Coding Scheme that it does not support then the mobile station shall return an ASSIGNMENT FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Channel Mode(s).

If the PDCH ASSIGNMENT COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return an ASSIGNMENT FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

If the mobile station receives a PDCH ASSIGNMENT COMMAND message with a Frequency List IE indicating frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send an ASSIGNMENT FAILURE message with cause "frequency not implemented". If the mobile station receives a PDCH ASSIGNMENT COMMAND message with a Mobile Allocation IE indexing frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send an ASSIGNMENT FAILURE message with cause "frequency not implemented".

NOTE: A PDCH ASSIGNMENT COMMAND message sent to a multi band mobile station shall not be considered invalid because it indicates frequencies that are all in a different frequency band to that of the current channel.

On the mobile station side, if RLC/MAC blocks are not successfully received within T3190 seconds, the mobile station reactivates the old channels, reconnects the TCHs if any and triggers the establishment of the main signalling link. It then sends an ASSIGNMENT FAILURE message, cause "protocol error unspecified" on the main DCCH and resumes the normal operation, as if no assignment attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the procedure.

When receiving the ASSIGNMENT FAILURE message, the network stops T3117.

If a lower layer failure happens while attempting to connect back to the old channels, the radio link failure procedure is applied (see clause 3.4.13.2).

On the network side, if timer T3117 elapses before either the network receives an RLC/MAC block from the mobile station on the new channel, or, an ASSIGNMENT FAILURE message is received on the old channels, then the old channels and the new resources are released, except that, if the old channel was a VGCS channel, the old channel shall be maintained and the uplink shall be set free.

On the network side, lower layer failure occurring on the old channels after the sending of the PDCH ASSIGNMENT COMMAND message are ignored.

3.4.20 RR-Network Controlled Cell Change Order

This clause is only applicable to mobiles supporting the <<GPRS>> option.

In dedicated mode or in group transmit mode, intracell or intercell change of channel(s) can be requested by the network RR sublayer. This change may be performed through the RR-network controlled cell change order procedure.

The purpose of the RR-network controlled cell change order procedure is to permit the complete modification of the channels allocated to the mobile station e.g. when the cell is changed. This procedure only commences while in dedicated mode or in group transmit mode.

The RR-network controlled cell change order procedure includes:

- The suspension of normal operation except for RR management (layer 3).
- The disconnection of the main signalling link, and of the other links via local end release (layer 2), and the disconnection of the TCH(s) if any.
- The disconnection and the deactivation of previously assigned channels and their release (layer 1).
- The complete acquisition of BCCH or PBCCH messages of the target cell. For a UTRAN target cell, broadcast channel acquisitions are defined in 3GPP TS 25.331 instead.
- The triggering of the establishment of a Temporary Block Flow. For a UTRAN target cell, the behaviour following channel establishment is defined in 3GPP TS 25.331 instead.

The RR-network controlled cell change order procedure is always initiated by the network.

3.4.20.1 RR-network controlled cell change order initiation

The network initiates the RR-network controlled cell change order procedure by sending a RR-CELL CHANGE ORDER message to the mobile station on the main DCCH. The network then starts timer T3119.

When a handover has taken place during dedicated connection, the network shall send a RR-CELL CHANGE ORDER message to the mobile station in order to establish TBF. In this case the target cell is equal to the old cell.

When sending this message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases, is suspended until resuming is indicated. These RR messages can be deduced from clause 3.4.3 and 8.5.1 "Radio Resource management".

Upon receipt of the RR-CELL CHANGE ORDER message, the mobile station starts timer T3134, and initiates, as described in clause 3.1.4, the release of link layer connections, disconnects the physical channels and commands the switching to the identified cell.
GERAN target cell:
The mobile station then performs a complete acquisition of BCCH or PBCCH messages (see 3GPP TS 04.60), and obeys the procedures relevant to the establishment of the Temporary Block Flow. The mobile station shall obey the RR-CELL CHANGE ORDER message irrespective of whether or not the mobile station has any knowledge of the relative synchronisation of the target cell to the serving cell.
UTRAN target cell:
Establishment of channel(s) is defined in 3GPP TS 25.331. A UTRAN capable mobile station shall obey the RR-CELL CHANGE ORDER message irrespective of whether the cell is know or not known (see 3GPP TS 25.133 and 3GPP TS 25.123).

The RR-CELL CHANGE ORDER message contains:

- The characteristics of the new cell that are necessary to identify it (i.e. BSIC + BCCH frequency). For a (3G) multi-RAT mobile station, the RR-CELL CHANGE ORDER message may contain information on a 3G target cell; in this case BSIC and BCCH frequency shall be ignored;

- the NC mode to be initially applied on the new cell.

The RR-CELL CHANGE ORDER does not contain a cipher mode setting IE. Any RR layer ciphering that may have been applied in dedicated mode shall not be applied to the target TBF or with the target cell.

3.4.20.2 Network controlled cell reselection completion

GSM target cell:

The network regards the procedure as successfully completed when it knows that communication has been established with that mobile station via the new cell (e.g. the network has received a RLC/MAC Block containing the mobile station's identity). The network then stops timer T3119.

The mobile station regards the procedure as successfully completed when it has received a response to a (PACKET) CHANNEL REQUEST message on the new cell which allocates it a resource on the new cell.

UTRAN target cell:

The network regards the procedure as successfully completed when it knows that communication has been established with that mobile station via the new cell (see 3GPP TS 25.331). The network then stops timer T3119.

The mobile station regards the procedure as successfully completed when it has received a successful response to its RRC Connection Request message, see 3GPP TS 25.331.

3.4.20.3 Abnormal cases

If the RR-CELL CHANGE ORDER message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return a HANDOVER FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

GSM target cell:
On the mobile station side, if timer T3134 times out before a response to the (PACKET) CHANNEL REQUEST message has been received, or, if an IMMEDIATE ASSIGNMENT REJECT message or a PACKET ACCESS REJECT is received from the new cell, or, if the contention resolution procedure fails on the new cell then the mobile station shall reactivate the old channels, reconnect the TCHs if any and trigger the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation as if no handover attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the RR-CELL CHANGE ORDER message was received.
UTRAN target cell:
On the mobile station side, if timer T3134 times out before a response to the RRC Connection Request message has been received on the new cell, or if a RRC Connection Reject message including Inter-RAT info set to 'GSM' is received from the new cell, then the mobile station shall reactivate the old channels, reconnect the TCHs if any and trigger the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation as if no handover attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the RR-CELL CHANGE ORDER message was received.

When the HANDOVER FAILURE message has been received, the network stops T3119.

If a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied (cf. clause 3.4.13.2).

On the network side, if timer T3119 elapses before either the mobile station has been recognised on the new cell, or a HANDOVER FAILURE message is received on the old channels, then the old channels are released, except that, if the old channel was a VGCS channel, the old channel shall be maintained and the uplink shall be set free.

On the network side, lower layer failures occurring on the old channels after the sending of the RR-CELL CHANGE ORDER message are ignored.

3.4.21 Application Procedures

3.4.21.1 General

While in dedicated mode, the following applications associated with the Radio Resource management layer may be supported in the network and MS:

3.4.21.2 Location Services (LCS)

Common procedures are defined in the Radio Resource management layer to assist these applications.

3.4.21.3 Application Information Transfer

The Application Information Transfer procedure enables an Application on the network side and a peer application in the MS to exchange Application Protocol Data Units (APDUs).

3.4.21.3.1 Normal Procedure without Segmentation

The maximum size of an APPLICATION INFORMATION message is 251 octets as defined in 3GPP TS 04.06. Segmentation shall not be used when an APDU fits into a single APPLICATION INFORMATION message of maximum or smaller size.

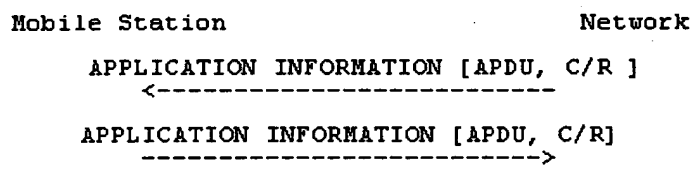

Figure 3.4.21.3.4.1/3GPP TS 04.18: Application Information Transfer without segmentation

Either the network or MS may send an APPLICATION INFORMATION message once the MS is in dedicated mode. The APDU Data in the APPLICATION INFORMATION message shall contain a complete APDU according to the protocol in use. The APDU ID IE identifies the protocol and associated application. The APDU Flags IE indicates "First or Only Segment", "Last or Only Segment" and conveys a C/R flag transparently between the communicating applications. The C/R Flag may be used to distinguish a command from other messages and a final response from a non-final response. The use of the C/R flag is defined with respect to each application. On receiving an APPLICATION INFORMATION message, the receiving layer 3 entity shall deliver the message contents to the identified local application.

3.4.21.3.2 Normal Procedure with Segmentation

Segmentation is applicable when an APDU is too large to fit into a single APPLICATION INFORMATION message. The procedure is applicable for either direction of transfer.

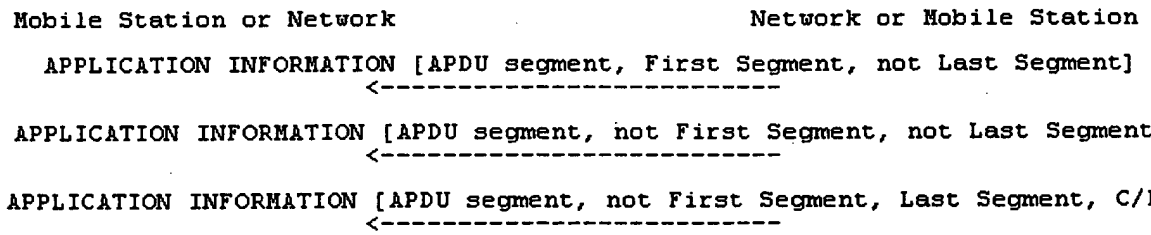

Figure 3.4.21.3.2.1/3GPP TS 04.18: Application Information Transfer with segmentation

The sending layer 3 entity shall segment an APDU by dividing it into one or more segments exactly fitting into maximum sized APPLICATION INFORMATION messages plus a final segment fitting into an APPLICATION INFORMATION message of maximum size or smaller. Once segmented, the resulting APPLICATION INFORMATION messages shall be transferred in sequence to the data link layer for transmission, without being intersperced by other level 3 messages. The first APPLICATION INFORMATION message in the sequence shall indicate "First Segment" and "Not Last Segment". Subsequent APPLICATION INFORMATION messages except for the last shall indicate "Not First Segment" and "Not Last Segment". The last APPLICATION INFORMATION message shall indicate "Not First Segment" and "Last Segment" and shall include a C/R flag as provided by the sending application.

The receiving layer 3 entity shall reassemble any segmented APDU before transfer to the local application. The receiver may employ a timer to detect possible loss of APDU segments. If employed, the timer shall be started when the first APDU segment is received and cancelled after the last segment is received.

3.4.21.3.3 Abnormal Cases

APPLICATION INFORMATION messages are sent using "low" priority at the data link layer. This can lead to message loss or truncation when preempted by other "high" priority messages. A receiving layer 3 entity shall detect APDU truncation if an APPLICATION INFORMATION message is received carrying an APDU or APDU segment that is shorter than indicated by the length indicator for the APDU Data IE. This test is reliable because preemption in the data link layer guarantees that at least the first 2*N201 octets of any truncated message will be reliably transferred.

An APPLICATION INFORMATION transfer error shall be detected due to any of the following:

a) Receipt of a truncated APDU or APDU segment;

b) While performing APDU reassembly

- receipt of any other layer 3 message defined to use SAPI 0 on the main DCCH;
- receipt of an APDU or APDU segment indicating "First or Only Segment";
- expiration of the reassembly timer (if supported);

c) While not performing APDU reassembly, receipt of an APDU segment indicating "not First or only segment";

d) Detection of any other error for a received message as defined in clause 8.

If APDU reassembly was in process when the error occurred, the receiving layer 3 entity shall discard the partially reassembled APDU and reprocess any received APDU or APDU segment that caused the error provided not an error defined in clause 8. In all other cases, any received APDU or APDU segment shall be discarded.

3.4.22 RR procedures related to packet resource establishment while in dedicated mode

The establishment of a packet resource is supported by procedures on the main DCCH when the mobile station is in dedicated mode. The procedures are only applicable to a mobile station supporting DTM with GPRS or EGPRS. The procedures are optional for the network.

These procedures constitute a complement to the corresponding procedures for temporary block flow establishment using CCCH or PCCCH while in idle mode defined in 3GPP TS 04.18 and 3GPP TS 04.60, respectively.

The packet request procedure is initiated by the MS and it is described in clause 3.4.22.1. The packet notification procedure is initiated by the network and it is described in 3.4.22.2. The packet downlink assignment is initiated by the network and it is described in clause 3.4.22.3.

3.4.22.1 Packet request procedure while in dedicated mode

The packet request procedure using the main DCCH may be used to establish a packet resource to support the transfer of LLC PDUs in the direction from the mobile station to the network.

3.4.22.1.1 Entering the dual transfer mode

While in dedicated mode, the establishment of an uplink packet resource may be initiated by the RR entity of the mobile station using the packet request procedure. The procedure is triggered by a request from upper layers to transfer an LLC PDU; see 3GPP TS 24.007. The request from upper layers specifies:

- TLLI,
- radio priority,
- RLC mode associated with the packet transfer,
- LLC frame type,
- establishment cause and
- QoS information for the requested packet session.

Upon such a request, the RR entity of the mobile station

- if access to the network is allowed (clause 3.4.22.1.1.1), it initiates the packet request procedure as defined in clause 3.4.22.1.1.2;
- otherwise, it rejects the request.

If the request from upper layers indicates any signalling procedure the acknowledged RLC mode shall be used.

3.4.22.1.1.1 Permission to access the network

Access to the network is allowed:

- if dual transfer mode is supported in the cell.

NOTE: belonging to an authorised access class or special class, radio priority level and LSA permission are not considered since they only apply to a mobile station in idle mode.

3.4.22.1.1.2 Initiation of establishment of the packet request procedure

The mobile station initiates the establishment the packet resource by sending a DTM REQUEST message on the main DCCH.

The DTM REQUEST message contains:

- TLLI;
- Channel Request Description;
- Packet establishment cause which indicates, as applicable, a request to send user data, cell update, page response or a mobility management message;

Having sent the DTM REQUEST message, the mobile station starts timer T3148.

3.4.22.1.1.3 Answer from the network

3.4.22.1.1.3.1 Packet assignment

On receipt of a DTM REQUEST message the network may allocate an uplink packet resource. The packet uplink resource is assigned to the mobile station in one of the DTM assignment messages:

- DTM ASSIGNMENT COMMAND or
- PACKET ASSIGNMENT.

These messages are sent in acknowledged mode on the main DCCH. If frequency hopping is applied, the mobile station shall use the cell allocation defined for the cell to decode the mobile allocation.

The allocation of the uplink packet resource may imply the reallocation of the resource for the RR connection. In this case, the DTM ASSIGNMENT COMMAND message is used and the timer T3107 is started on the network side. The DTM ASSIGNMENT COMMAND message shall not be used to change to a dependent configuration.

When sending the DTM ASSIGNMENT COMMAND message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases is suspended until resumption is indicated. These RR messages can be deduced from clauses 3.4.22.1 and 8.8 Radio Resource management.

The PACKET ASSIGNMENT message is only used when the packet resource is a PDCH and no reallocation of the RR connection is needed.

On receipt of:

- DTM ASSIGNMENT COMMAND message or
- PACKET ASSIGNMENT message,

the mobile station shall stop T3148.

If the received DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message includes uplink packet resources, the mobile station shall proceed with the packet access. If the received message includes downlink packet resources and no uplink packet resources, the mobile station shall abort the packet access procedure and proceed with the procedure specified in clause 3.4.22.3, and then attempt an establishment of uplink TBF, using the applicable procedure specified in 3GPP TS 04.60.

Upon receipt of the DTM ASSIGNMENT COMMAND message, the mobile station initiates a local end release of link layer connections, disconnects the physical channels, commands the switching to the assigned channel and initiates the establishment of lower layer connection (this includes the activation of the channel, their connection and the establishment of the main signalling link).

3.4.22.1.1.3.2 RR reallocation only

If the mobile station receives an ASSIGNMENT COMMAND or HANDOVER COMMAND message during the packet access procedure, the mobile station shall abort the packet access procedure, stop timer T3148 and proceed with the channel assignment procedure as specified in clause 3.4.3 or the handover procedure as specified in clause 3.4.4. The mobile station shall then attempt an establishment of uplink TBF, using the procedure specified in clause 3.4.22.

If the mobile station receives a CHANNEL RELEASE message during the packet access procedure, the mobile station shall abort the packet access procedure, stop timer T3148 and proceed with the RR connection release procedure as specified in clause 3.4.13. The mobile station shall then attempt an establishment of uplink TBF.

If the mobile station receives an INTER SYSTEM TO UTRAN HANDOVER COMMAND message during the packet access procedure, the mobile station shall abort the packet access procedure, stop timer T3148 and proceed with the handover to UTRAN procedure as specified in clause 3.4.4a.

3.4.22.1.1.3.3 Packet request rejection

If the network cannot allocate the requested packet resource it may send the mobile station a DTM REJECT message in acknowledged mode on the main DCCH. This message contains a wait time ("wait indication" information element).

On receipt of the DTM REJECT message, the mobile station stops T3148, notifies upper layers of a packet resource establishment failure and starts timer T3142 with the indicated value.

The mobile station is not allowed to make a new attempt for packet access in the same cell until T3142 expires. The value of the wait indication (i.e. T3142) relates to the cell from which it was received.

3.4.22.1.1.4 Packet request completion

The completion of the packet request procedure depends on the actual assignment message used by the network:

- when the network sends a DTM ASSIGNMENT COMMAND message (i.e. reallocation of the CS resource is required), after the main signalling link is successfully established, the mobile station returns an ASSIGNMENT COMPLETE message, specifying cause "normal event", to the network on the main DCCH. The packet request procedure is completed for the mobile station when the ASSIGNMENT COMPLETE message is sent and for the network when it is received. The network then stops timer T3107. The sending of the ASSIGNMENT COMPLETE message on the mobile station side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those belonging to RR management.

- when the network sends a PACKET ASSIGNMENT message, the packet request procedure is completed for the network when assignment message is sent and for the mobile station when it is received.

When the packet request procedure is completed, the mobile station has entered the dual transfer mode.

3.4.22.1.1.5 Abnormal cases

If a failure occurs on the mobile station side before the packet request procedure is completed, all the allocated packet resources are released, the mobile station remains on the current channel and upper layers are notified (packet resource establishment failure). If the received message was DTM ASSIGNMENT COMMAND, the mobile station shall return a DTM ASSIGNMENT FAILURE message with an appropriate cause value. In the following cases a packet resource establishment failure has occurred:

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message indicates resources in a non-supported frequency band. The cause value is "frequency not implemented".

- If the information available in the mobile station after the reception of a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message does not satisfactorily define uplink packet resources. The cause value is "protocol error unspecified".

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message includes a mobile allocation or a frequency list that indexes frequencies in more than one frequency band. The cause value is "frequency not implemented".

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message assigns resources not compliant with the multislot capabilities of the mobile station. The cause value is "channel mode unacceptable".

- If the mobile station has no current CA and if it needs a CA to analyse the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message. The cause value is "no cell allocation available".

- If the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message instructs the mobile station to use a channel description or mode that it does not support. The cause value is "channel mode unacceptable".

- If the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message does not include any uplink or downlink packet resources. The cause value is "protocol error unspecified ".

- If the network commands the mobile station to reallocate the RR connection and the establishment of the main DCCH fails, the mobile station shall revert to the old channel and send a DTM ASSIGNMENT FAILURE message on the old main DCCH with cause value "lower layer failure".

- At expiry of timer T3148.

When receiving the ASSIGNMENT FAILURE message, the network stops T3107.

3.4.22.2 Packet notification procedure in dedicated mode

The packet notification procedure is initiated by the RR entity of the network side. It is triggered by a page request from the GMM sublayer, see 3GPP TS 24.007.

3.4.22.2.1 Packet notification initiation by the network

The network initiates the packet notification procedure by sending the mobile station a PACKET NOTIFICATION message on the main DCCH.

The network shall not send the PACKET NOTIFICATION message to a mobile station that does not support dual transfer mode operation. If a mobile station not supporting dual transfer mode receives this message, it shall ignore it and remain in dedicated mode.

3.4.22.2.2 Packet notification response

Upon receipt of the PACKET NOTIFICATION message, the RR sublayer of the mobile station indicates the receipt of a packet paging request to the GMM sublayer; see 3GPP TS 24.007.

3.4.22.3 Packet downlink assignment in dedicated mode

The packet downlink assignment procedure in dedicated mode may be used to establish a packet resource to support the transfer of LLC PDUs in the direction from the network to the mobile station.

This procedure is only applicable to a mobile station in dedicated mode and with no TBF allocated. If the mobile station already has an ongoing TBF, the establishment of the downlink packet resource is performed on the PACCH; see 3GPP TS 04.60.

The establishment of a downlink packet resource is initiated by the RR entity on the network side using the packet downlink assignment procedure in dedicated mode. The procedure is triggered by a request from upper layers to transfer an LLC PDU; see 3GPP TS 24.007. The request from upper layers specifies a QoS profile, an *RLC mode*, *DRX parameters* and an *MS classmark* associated with the packet transfer.

3.4.22.3.1 Initiation of the packet downlink assignment procedure in dedicated mode

The network initiates the packet downlink assignment procedure in dedicated mode by sending a DTM assignment message (i.e. DTM ASSIGNMENT COMMAND or a PACKET ASSIGNMENT) in acknowledged mode on the main DCCH.

When sending the DTM ASSIGNMENT COMMAND message on the network side, and when receiving it on the mobile station side, all transmission of signalling layer messages except for those RR messages needed for this procedure and for abnormal cases is suspended until resumption is indicated. These RR messages can be deduced from clauses 3.4.22.3 and 8.8 Radio Resource management.

The allocation of the downlink packet resource may imply the reallocation of the resource for the RR connection. In this case, the DTM ASSIGNMENT COMMAND message is used and the timer T3107 is started on the network side. The DTM ASSIGNMENT COMMAND message shall not be used to change to a dependent configuration.

The network shall not send any of the DTM assignment messages to a mobile station that does not support dual transfer mode operation. If a mobile station not supporting dual transfer mode receives any of these messages, it shall ignore it and remain in dedicated mode.

When a TBF is assigned:

- The assignment message may indicate a TBF starting time.
- If the mobile station receives the message before the TBF starting time has expired, it shall wait until the frame number indicated by the TBF starting time and switch to the assigned PDCH.
- If the mobile station receives the message after the TBF starting time has expired, it shall ignore the indicated TBF starting time and switch to the assigned PDCH.

Upon receipt of the DTM ASSIGNMENT COMMAND message, the mobile station initiates a local end release of link layer connections, disconnects the physical channels, commands the switching to the assigned channel and initiates the establishment of lower layer connection (this includes the activation of the channel, their connection and the establishment of the main signalling link).

3.4.22.3.2 Packet downlink assignment completion

The completion of the packet downlink assignment procedure while in dedicated mode depends on the actual assignment message used by the network:

- when the network sends a DTM ASSIGNMENT COMMAND message (i.e. reallocation of the RR connection is required), after the main signalling link is successfully established, the mobile station returns an ASSIGNMENT COMPLETE message, specifying cause "normal event", to the network on the main DCCH. The packet downlink assignment procedure is completed for the mobile station when the ASSIGNMENT COMPLETE message is sent and for the network when it is received. The network then stops timer T3107. The sending of the ASSIGNMENT COMPLETE message on the mobile station side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those belonging to RR management.

- when the network sends a PACKET ASSIGNMENT message, the packet downlink assignment procedure is completed for the network when assignment message is sent and for the mobile station when it is received.

3.4.22.3.3 Abnormal cases

If a failure occurs on the mobile station side before the packet downlink assignment procedure is completed (packet establishment failure), all the allocated packet resources are released and the mobile station remains on the current channel. If the received message was a DTM ASSIGNMENT COMMAND, the mobile station shall return a DTM ASSIGNMENT FAILURE message with an appropriate cause value.

In the following cases a packet resource establishment failure has occurred:

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message indicates packet resources in a non-supported frequency band. The cause value is "frequency not implemented".

- If the information available in the mobile station after the reception of a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message does not satisfactorily define downlink packet resources. The cause value is "protocol error unspecified".

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message includes a mobile allocation or a frequency list that indexes frequencies in more than one frequency band. The cause value is "frequency not implemented".

- If a DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message assigns resources not compliant with the multislot capabilities of the mobile station. The cause value is "channel mode unacceptable".

- If the mobile station has no current CA and if it needs a CA to analyse the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message. The cause value is "no cell allocation available".

- If the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message instructs the mobile station to use a channel description or mode that it does not support. The cause value is "channel mode unacceptable".

- If the DTM ASSIGNMENT COMMAND or PACKET ASSIGNMENT message does not include any downlink packet resources, or if it includes uplink packet resources. The cause value is "protocol error unspecified".

- If the network commands the mobile station to reallocate the RR connection and the establishment of the main DCCH fails, the mobile station shall revert to the old channel and send a DTM ASSIGNMENT FAILURE message on the old main DCCH with cause value "lower layer failure".

When receiving the ASSIGNMENT FAILURE message, the network stops T3107.

3.4.22.4 Modification of packet resources while in DTM

When the mobile station is in dual transfer mode, the network or mobile station may wish to modify the allocated packet resource. When the mobile station has an ongoing TBF, the procedures described in 3GPP TS 04.60 shall be used. When the main DCCH is the only packet resource that the mobile station has, the RR procedures related to packet resource establishment while in dedicated mode shall be used.

3.4.23 RR procedures related to packet resource maintenance while in dual transfer mode

Once the mobile station enters the dual transfer mode, the existent procedures apply (see 3GPP TS 04.60). Some exceptions to the existent procedures while in dedicated mode are:

- When all packet resources have been released (or aborted), the mobile station returns to dedicated mode.
- When the mobile station is in dual transfer mode, it shall ignore any RR-CELL CHANGE ORDER or PACKET CELL CHANGE ORDER message and shall remain in dual transfer mode.
- When the mobile station receives a HANDOVER COMMAND or an ASSIGNMENT COMMAND message, it shall abandon the packet resource immediately, enter dedicated mode and perform the handover or assignment procedure, respectively.
- As stated in 3GPP TS 05.08, no GPRS measurement reporting is performed.

The mobile station remains in dual transfer mode until the RR connection or all the packet resources are released.

3.4.24 RR procedures related to packet resource release while in dual transfer mode

The release of a TBF shall follow the procedures in 3GPP TS 04.60.

In the case of the release of the RR connection while in dual transfer mode, the mobile station shall abandon the packet resource and, once in idle mode and packet idle mode, it may start a new establishment as described in 3GPP TS 04.60.

3.4.25 GPRS suspension procedure

3.4.25.1 General

This procedure enables the network to suspend GPRS services packet flow in the downlink direction. The support of this procedure is conditional to the support of GPRS by the mobile station.

When a mobile station which is IMSI attached for GPRS services (see 3GPP TS 24.008) enters the dedicated mode, and when the mobile station limitations make it unable to handle both dedicated mode and either packet idle mode or packet transfer mode simultaneously, the mobile station shall perform the GPRS suspension procedure.

The RR sublayer of the mobile station shall indicate a RR GPRS suspend condition to the MM sublayer, see 3GPP TS 24.008.

3.4.25.2 MS in class B mode of operation

The GPRS suspension procedure shall be used to suspend GPRS services when the mobile station is in class B mode of operation and a circuit switched service is initiated. It is also used when a mobile station in CS/PS mode of operation in UTRAN reverts to class B mode of operation in GSM.

The GPRS suspension procedure is initiated by the mobile station by sending a GPRS SUSPENSION REQUEST message with the appropriate suspension cause. This can be done as early as possible after access but shall be done after sending a CLASSMARK CHANGE message.

3.4.25.3 Dual transfer mode not supported

The GPRS suspension procedure shall be used to suspend GPRS services:

a) when the mobile station in a class A mode of operation is handed over to a cell where the support of Class A mode of operation is not possible (e.g. a DTM mobile station entering a cell not supporting DTM)

b) when the GPRS attached mobile station is in a cell that does not support DTM and a circuit switched service is initiated.

In case a), when the mobile station concludes that DTM is not supported in the new cell after the handover procedure is completed, it shall initiate the GPRS suspension procedure by sending a GPRS SUSPENSION REQUEST message with the suspension cause set to "DTM not supported in the cell".

In case b), the GPRS suspension procedure is initiated by the mobile station by sending a GPRS SUSPENSION REQUEST message with the suspension cause set to "DTM not supported in the cell". This can be done as early as possible after access but shall be done after sending a CLASSMARK CHANGE message.

3.4.26 GPRS Transparent Transport Procedure

While in dedicated mode, upper layers in the mobile station or in the network may request the transport of GPRS information transparently over the radio interface. This procedure is only applicable when

- the information from upper layers is signalling information and
- the GTTP length of the message is below the maximum indicated by the network.

In any other case, the RR procedures related to packet resource establishment while in dedicated mode apply.

The information from upper layers shall be carried inside the GTTP Information message. The GTTP Information message contains:

- the TLLI of the MS and
- the LLC PDU.

The GTTP messages are sent using "normal" priority at the data link layer.

3.5 RR procedures on CCCH related to temporary block flow establishment

The establishment of a temporary block flow (TBF) on a packet data physical channel is supported by procedures on CCCH when PCCCH is not provided in the cell. The procedures for temporary block flow establishment using CCCH are only applicable to a mobile station supporting GPRS. The procedures are optional for the network.

These procedures constitute a complement to the corresponding procedures for temporary block flow establishment using PCCCH, defined in 3GPP TS 04.60, and include the procedures using CCCH for *packet paging* (clause 3.5.1), *packet access* (clause 3.5.2) and *packet downlink assignment* (clause 3.5.3).

3.5.1 Packet paging procedure using CCCH

The network can initiate the packet paging procedure in order to cause upper layers in the mobile station to respond, see clause 4. The packet paging procedure can only be initiated by the network.

3.5.1.1 Packet paging initiation by the network

The packet paging procedure is initiated by the RR entity of the network side. It is triggered by a page request from the MM sublayer, see 3GPP TS 24.007.

The network initiates the paging procedure by sending a paging request message on an appropriate paging subchannel on CCCH or PCCCH. Paging initiation using a paging subchannel on CCCH is used when sending paging information to a mobile station and PCCCH is not present in the cell.

NOTE 1: There are three types of paging request messages that are applicable:

- PAGING REQUEST TYPE 1;
- PAGING REQUEST TYPE 2; and
- PAGING REQUEST TYPE 3.

In a PAGING REQUEST message used for the packet paging procedure, the mobile station shall be identified by the P-TMSI (GPRS TMSI) or its IMSI. If the mobile station is identified by the P-TMSI, it shall proceed as specified in clause 3.5.1.2.

If the mobile station identified by its IMSI, it shall parse the message for a corresponding *Packet Page Indication* field:

- if the *Packet Page Indication* field indicates a paging procedure for RR connection establishment, or the field is not present in the message, the mobile station shall proceed as specified in clause 3.3.2.2;
- if the *Packet Page Indication* field indicates a packet paging procedure, the mobile station shall proceed as specified in clause 3.5.1.2.

A PAGING REQUEST message may include more than one mobile station identification.

The mobile station in packet idle mode is required to receive and analyse the paging messages and immediate assignment messages sent on the paging subchannels on CCCH corresponding to the paging groups determined for it in packet idle mode, as specified in 3GPP TS 05.02. These messages contain a page mode information element.

NOTE 2: The possible immediate assignment messages are: the IMMEDIATE ASSIGNMENT, the IMMEDIATE ASSIGNMENT EXTENDED and the IMMEDIATE ASSIGNMENT REJECT messages.

The treatment of page mode information, including the procedure when the mobile station selects a new PCH, and the procedure if a message in a paging subchannel is not received correctly are defined in clause 3.3.2.1.1.

3.5.1.2 On receipt of a packet paging request

On the receipt of a paging request message, the RR sublayer of addressed mobile station indicates the receipt of a paging request to the MM sublayer, see 3GPP TS 24.007.

3.5.2 Packet access procedure using CCCH

The packet access procedure using CCCH may be used to establish a temporary block flow to support the transfer of LLC PDUs in the direction from the mobile station to the network. Establishment using one phase and two phase packet access, see 3GPP TS 04.60, are supported. The two phase packet access is supported by means of the single block or multiple block packet access option in this procedure, allowing the transfer of a PACKET RESOURCE REQUEST and possibly an ADDITIONAL MS RADIO ACCESS CAPABILITIES message to the network.

The single block packet access option in this procedure may also be used by a mobile station in packet idle mode to transfer an RLC/MAC control message other than the PACKET RESOURCE REQUEST message to the network, see clause 3.5.2.2.

3.5.2.1 Entering the packet transfer mode: packet access procedure

The establishment of an uplink temporary block flow may be initiated by the RR entity of the mobile station using the packet access procedure. The procedure is triggered by a request from upper layers to transfer a LLC PDU, see 3GPP TS 24.007. The request from upper layers specifies *radio priority* and an *RLC mode* associated with the packet transfer or it indicates that the packet to be transferred contains signalling.

Upon such a request,

- if access to the network is allowed (clause 3.5.2.1.1), the RR entity of the mobile station initiates the packet access procedure as defined in clause 3.5.2.1.2;
- otherwise, it rejects the request.

If the request from upper layers indicates signalling, the highest *radio priority* level shall be used at determination if access to the network is allowed, and the acknowledged RLC mode shall be used.

3.5.2.1.1 Permission to access the network

Access to the network is allowed:

- if the mobile station is a member of at least one authorized access class or special access class as defined in clause 3.3.1.1.1, and
- if packet access is allowed in the cell for the *radio priority* level associated with the packet transfer, as indicated by the PRIORITY_ACCESS_THR parameter broadcast in SI 13 message.
- if the cell belongs to one of the allowed LSAs for the mobile station, as indicated on the SIM, in the case where the mobile station is a LSA only access subscriber.

3.5.2.1.2 Initiation of the packet access procedure: channel request

The mobile station initiates the packet access procedure by scheduling the sending of CHANNEL REQUEST messages on RACH.

Alternatively, if the SI13 indicates that the cell is EGPRS capable and EGPRS PACKET CHANNEL REQUEST on RACH is supported in the cell, an EGPRS mobile station shall send the 11 bits EGPRS PACKET CHANNEL REQUEST messages at one-phase access attempts, two-phase access attempts and short access attempts (see 3GPP TS 04.60); if the SI 13 indicates that the cell is EGPRS capable and EGPRS PACKET CHANNEL REQUEST on RACH is not supported in the cell, the EGPRS mobile station shall use the 8 bit CHANNEL REQUEST message and shall initiate a two phase access request.

The mobile station then leaves the packet idle mode. In particular, the mobile station station shall ignore PAGING REQUEST messages indicating a packet paging procedure.

A mobile station belonging to GPRS MS class A or B shall continue to monitor its paging subchannel on CCCH for PAGING REQUEST messages indicating an establishment of RR connection. A mobile station belonging to GPRS MS class B may abort the packet access procedure at the receipt of a PAGING REQUEST messages indicating an establishment of RR connection.

The mobile station schedules CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages on RACH as defined in clause 3.3.1.1.2.

The CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages are sent on RACH and contain the parameters:

- an establishment cause which indicates packet access, and as applicable, a request for one phase packet access or single block packet access for a CHANNEL REQUEST (clause 9.1.8), or a request for one phase access or two phase access or short access for a EGPRS PACKET CHANNEL REQUEST (see 3GPP TS 04.60);
- a random reference which is drawn randomly from an uniform probability distribution for every new transmission.

If the requested RLC mode is *unacknowledged mode*, the mobile station shall request a single block packet access and attempt a two phase packet access. If the requested RLC mode is *unacknowledged EGPRS mode TBF*, the mobile station shall request and attempt a two phase packet access.

If the purpose of the packet access procedure is to send a Page Response, Cell update, for a GPRS Mobility Management or a GPRS Session Management procedure, (i.e. the access is for Layer 3 signalling only, and not for a Layer 3 data transfer), the mobile station shall request a one phase packet access by sending a CHANNEL REQUEST message.

If the purpose of the packet access procedure is to send a PACKET PAUSE message the mobile station shall request a single block packet access. Upon sending the first CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST message the mobile station shall start timer T3204. If timer T3204 expires before an IMMEDIATE ASSIGNMENT message granting a single block period on an assigned packet uplink resource is received, the packet access procedure is aborted. If the mobile station receives an IMMEDIATE ASSIGNMENT message during the packet access procedure indicting a packet downlink assignment procedure, the mobile station shall ignore the message.

After sending the first CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST message, the mobile station shall start listening to the BCCH; it shall also listen to the full downlink CCCH timeslot corresponding to its CCCH group. The mobile station shall perform signal strength measurements as they are defined for packet idle mode, see 3GPP TS 05.08.

Having sent the maximum number of CHANNEL REQUEST messages, the mobile station starts timer T3146. At expiry of timer T3146, the packet access procedure is aborted and a packet access failure is indicated to upper layers.

If the mobile station receives an IMMEDIATE ASSIGNMENT message during the packet access procedure indicating a packet downlink assignment procedure, the mobile station shall abort the packet access procedure and respond to the IMMEDIATE ASSIGNMENT message as specified in clause 3.5.3.1.2. The mobile station shall then attempt an establishment of uplink TBF, using the procedure specified in 3GPP TS 04.60 which is applicable in packet transfer mode.

3.5.2.1.3 Packet immediate assignment

3.5.2.1.3.1 On receipt of a CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST message

On receipt of a CHANNEL REQUEST message indicating a packet access, the network may allocate a temporary flow identity and assign a packet uplink resource comprising one PDCH for an uplink temporary block flow in GPRS TBF mode. On receipt of a EGPRS PACKET CHANNEL REQUEST message, the network may allocate a temporary flow identity and assign a packet uplink resource comprising one PDCH for an uplink temporary block flow in EGPRS TBF mode or GPRS TBF mode.

If the establishment cause in the CHANNEL REQUEST message indicates a request for a single block packet access, the network shall grant only the single block period on the assigned packet uplink resource if the network allocates resource for the mobile station. If the establishment cause in the EGPRS PACKET CHANNEL REQUEST message indicates a request for a two phase access, the network shall grant one or two radio blocks for the mobile station (within a Multi Block allocation) to send a PACKET RESOURCE REQUEST and possibly an ADDITIONAL MS RADIO ACCESS CAPABILITIES messages on the assigned packet uplink resource if the network allocates resource for the mobile station.

If the establishment cause in the CHANNEL REQUEST message indicates a request for one phase packet access, the network may grant either a one phase packet access or a single block packet access for the mobile station. If a single block packet access is granted, it forces the mobile station to perform a two phase packet access. If the establishment cause in the EGPRS PACKET CHANNEL REQUEST message indicates a request for one phase packet access, the network may grant either a one phase packet access or a two phase access (within a Multi Block allocation). If a multiple block packet access is granted, it forces the mobile station to perform a two phase packet access.

The packet uplink resource is assigned to the mobile station in an IMMEDIATE ASSIGNMENT message sent in unacknowledged mode on the same CCCH timeslot on which the network has received the CHANNEL REQUEST or the EGPRS PACKET CHANNEL REQUEST message. There is no further restriction on what part of the downlink CCCH timeslot the IMMEDIATE ASSIGNMENT message can be sent. Timer T3141 is started on the network side.

The IMMEDIATE ASSIGNMENT message contains:

- the information field of the CHANNEL REQUEST or the EGPRS PACKET CHANNEL REQUEST message and the frame number of the frame in which the CHANNEL REQUEST or the EGPRS PACKET CHANNEL REQUEST message was received;
- the packet channel description;
- the initial timing advance;
- the packet uplink assignment or EGPRS packet uplink assignment construction.

If frequency hopping is applied, the network may use the indirect encoding or the direct encoding of the frequency configuration in the *Packet Channel Description* information element. If the indirect encoding is used, the mobile station uses information received in system information or stored from a previous assignment to determine the frequency parameters, see 3GPP TS 04.60. If the direct encoding is used, the mobile station uses the cell allocation defined for the cell to decode the mobile allocation.

If the *indirect encoding* is used, the IMMEDIATE ASSIGNMENT message may contain a CHANGE_MARK_1 field. If that is present, the mobile station shall verify the validity of the SI13_CHANGE_MARK associated with the GPRS mobile allocation to which the message refers, see 3GPP TS 04.60. If the CHANGE_MARK_1 field and the SI13_CHANGE_MARK do not match, the message does not satisfactorily define a PDCH.

If the mobile station receives an IMMEDIATE ASSIGNMENT message and the *Dedicated mode or TBF* information element indicates that this is the first message in a two-message assignment, the mobile station shall continue to listen to the full CCCH. The network may send a second IMMEDIATE ASSIGNMENT message to the mobile station within two multiframe periods following the first IMMEDIATE ASSIGNMENT message, specifying the packet channel description and, if required, a mobile allocation for the assignment. The two IMMEDIATE ASSIGNMENT messages in a two-message assignment shall have the same contents of the *Request Reference* information elements.

If the mobile station does not receive the second IMMEDIATE ASSIGNMENT messages in a two-message assignment within two multiframe periods following the first message, the mobile station shall discard the first IMMEDIATE ASSIGNMENT message received.

On receipt of an IMMEDIATE ASSIGNMENT message or, in case of a two-message assignment, a matching pair of IMMEDIATE ASSIGNMENT messages corresponding to one of its 3 last CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages, the mobile station stops T3146 (if running), stops sending CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages, and switches to the assigned PDCH.

The content of the packet uplink assignment construction (respectively EGPRS packet uplink assignment construction indicates which type of packet access is granted: *one phase packet access* or *single (respectively multiple) block packet access*

3.5.2.1.3.2 One phase packet access

In the case the one phase packet access is granted, the packet uplink assignment construction contains:

- the temporary flow identity;
- the USF value, if the medium access method is dynamic allocation;
  or
  the fixed allocation bitmap, if the medium access method is fixed allocation;
- the channel coding scheme for RLC data blocks;
- the power control parameters;
- the polling bit ;- optionally, the timing advance index (see 3GPP TS 05.10);
- optionally, the TBF starting time (note: TBF starting time is mandatory if medium access method is fixed allocation).

In addition, the EGPRS packet uplink assignment construction also contains :

- the EGPRS modulation and coding scheme ;
- information whether retransmitted uplink data blocks shall be resegmented or not ;
- the EGPRS window size to be used within the transmission ;
- optionally a request for the mobile station to send its radio access capability information.

The medium access method is *dynamic allocation* or *fixed allocation* and the RLC mode is *acknowledged mode*, see 3GPP TS 04.60.

If the medium access method is *fixed allocation,* and the number of blocks allocated in the ALLOCATION_BITMAP is not sufficient to transfer all the RLC/MAC blocks that the MS has to transmit at the time the packet uplink assignment construction is received, the MS shall request additional resources by sending a PACKET RESOURCE REQUEST on one of the allocated blocks.

If the timing advance index (TAI) is included in the packet uplink assignment construction, the mobile station shall use the continuous update timing advance mechanism, see 3GPP TS 05.10, using PTCCH in the same timeslot as the assigned PDCH. If a timing advance index (TAI) field is not included, the continuous update timing advance mechanism shall not be used.

In case the packet uplink assignment or EGPRS packet uplink assignment construction contains a TBF starting time and the mobile station receives the message before the TBF starting time has expired, it shall wait until the frame number indicated by the TBF starting time before accessing the channel. If the mobile station receives the message after the TBF starting time has expired, it shall ignore the TBF starting time and may immediately access the channel. If the medium access method is *dynamic allocation*, the mobile station shall start timer T3164. Regardless of which allocation mode is used, the mobile station shall proceed with the contention resolution at one phase access defined in 3GPP TS 04.60.

If the Polling bit is set to 1, MS shall send a PACKET CONTROL ACKNOWLEDGEMENT message (see 04.60) on the assigned PDCH, in the uplink block specified by the TBF Starting Time. In this case the TBF Starting Time is used both to indicate when the assigned PDCH becomes valid and to specify the uplink block. If the TBF Starting Time is not present or has expired, the MS shall ignore the polling request.

When the mobile station switches to the assigned PDCH, it shall take the power control parameters received in the IMMEDIATE ASSIGNMENT message into account, perform signal strength measurements and apply output power control procedures as they are defined for packet transfer mode, see 3GPP TS 05.08.

When assigning an EGPRS TBF, the network may request information about radio access capabilities of the mobile station on one or several frequency bands within the IMMEDIATE ASSIGNMENT message ; the list of frequency bands is ordered by the network starting with the most important and ending with the least important one. The mobile station shall provide the network with its radio access capabilities for the frequency bands it supports, in the same priority order as the one specified by the network, by sending a PACKET RESOURCE REQUEST message, and an ADDITIONAL MS RADIO ACCESS CAPABILITIES if all the requested informations do not fit in the PACKET RESOURCE REQUEST. If the mobile station does not support any frequency band requested by the network, it shall report its radio access capabilities for the BCCH frequency band. The mobile station shall indicate in the PACKET RESOURCE REQUEST if it will send more information about its radio access capabilities in the ADDITIONAL MS RADIO ACCESS CAPABILITIES message. The PACKET RESOURCE REQUEST and the ADDITIONAL MS RADIO ACCESS CAPABILITIES shall be sent within the one or two first radio blocks allocated for the mobile station on the assigned PDCH.

The network may request a retransmission of the PACKET RESOURCE REQUEST and the ADDITIONAL MS RADIO ACCESS CAPABILITIES messages. A request for retransmission of one or both of these messages shall be indicated in the PACKET UPLINK ACK/NACK message. The mobile station has to indicate within the PACKET RESOURCE REQUEST if the message is a retransmitted one.

3.5.2.1.3.3 Single block packet access

In the case the single block packet access is granted, the packet uplink resource description contains:

- the power control parameter setting;
- the TBF starting time.

If the mobile station receives the IMMEDIATE ASSIGNMENT message before the TBF starting time has expired, it shall wait until the block period indicated by the TBF starting time. The network shall use the TBF starting time to indicate the first frame number belonging to the single block period granted for packet access. The mobile station may either use the assigned block period to send a PACKET RESOURCE REQUEST message to initiate the two phase packet access procedure defined in 3GPP TS 04.60, or to send an RLC/MAC control message other than the PACKET RESOURCE REQUEST message to the network, see clause 3.5.2.2.

If the mobile station receives the IMMEDIATE ASSIGNMENT message after the TBF starting time has expired, a failure has occurred.

If a failure occurs and the packet access attempt was due to a request from upper layers to transfer a LLC PDU, a TBF establishment failure has occurred and the mobile station proceeds as specified in clause 3.5.2.1.5. If a failure occurs and the packet access attempt was due to the sending of an RLC/MAC control message, the packet access is aborted, the mobile station returns to packet idle mode.

3.5.2.1.3.3a Multiblock packet access

In the case the multiblock packet access is granted, the EGPRS packet uplink assignment description contains:

- timeslot number of the allocation and the number of blocks allocated;
- the power control parameter setting;
- the TBF starting time.

When assigning a multiblock packet access, the network may request information about radio access capabilities of the mobile station on one or several frequency bands within the IMMEDIATE ASSIGNMENT message and allocate one or two radio blocks for uplink control messages accordingly ; the list of frequency bands is ordered by the network starting with the most important and ending with the least important one . The mobile station shall then provide the network with its radio access capabilities for the frequency bands it supports, in the same priority order as the one specified by the network, by sending a PACKET RESOURCE REQUEST message in the first radio block on the assigned PDCH, and an ADDITIONAL MS RADIO ACCESS CAPABILITIES immediately after the PACKET RESOURCE REQUEST message on the assigned PDCH if all the requested informations do not fit in the PACKET RESOURCE REQUEST and two radio blocks have been allocated by the network. If the mobile station does not support any frequency band requested by the network, it shall report its radio access capabilities for the BCCH frequency band in the PACKET RESOURCE REQUEST message. The mobile station shall indicate in the PACKET RESOURCE REQUEST if it will send more information about its radio access capabilities in the ADDITIONAL MS RADIO ACCESS CAPABILITIES message. If the mobile station has been allocated two radio blocks and all the requested informations fit in the PACKET RESOURCE REQUEST message, no ADDITIONAL MS RADIO ACCESS CAPABILITIES message shall be sent (see 3GPP TS 04.60). Instead, some uplink control block (e.g. packet measurement report, packet uplink dummy control block) may be sent by the mobile station.

The network may indicate in the next PACKET UPLINK ASSIGNMENT message a request for retransmission of the ADDITIONAL MS RADIO ACCESS CAPABILITIES message (see 3GPP TS 04.60).

If the mobile station receives the IMMEDIATE ASSIGNMENT message before the TBF starting time has expired, it shall wait until the block period indicated by the TBF starting time. The network shall use the TBF starting time to indicate the first frame number belonging to the multi block period granted for packet access. If the mobile station receives the IMMEDIATE ASSIGNMENT message after the TBF starting time has expired, a failure has occurred.

If a failure occurs and the packet access attempt was due to a request from upper layers to transfer a LLC PDU, a TBF establishment failure has occurred and the mobile station proceeds as specified in clause 3.5.2.1.5. If a failure occurs and the packet access attempt was due to the sending of an RLC/MAC control message, the packet access is aborted, the mobile station returns to packet idle mode.

3.5.2.1.3.4 Packet access rejection

The network may send to the mobile station an IMMEDIATE ASSIGNMENT REJECT message in unacknowledged mode on the same CCCH timeslot on which the channel request message was received. There is no further restriction on what part of the downlink CCCH timeslot an IMMEDIATE ASSIGNMENT REJECT message can be sent. This message contains the request reference and a wait indication.

On receipt of an IMMEDIATE ASSIGNMENT REJECT message corresponding to one of its 3 last CHANNEL REQUEST messages, the mobile station stops sending CHANNEL REQUEST messages, starts timer T3142 with the indicated value, ("wait indication" information element), starts T3146 if it has not already been started, and listens to the downlink CCCH until T3146 expires. During this time, additional IMMEDIATE ASSIGNMENT REJECT messages are ignored, but any immediate assignment corresponding to any other of its 3 last CHANNEL REQUEST messages make the mobile station follow the procedure in clause 3.5.2.1.3.1. If no such immediate assignment is received, the mobile station returns to packet idle mode and notify higher layers (TBF establishment failure) and notify higher layers (TBF establishment failure).

If the purpose of the packet access procedure is to send a PACKET PAUSE message and an IMMEDIATE ASSIGNMENT REJECT message is received, the packet access procedure is aborted.

If the mobile station has received responses from the network on all, or in case more than 3 were sent the last 3, of its CHANNEL REQUEST messages, it shall immediately return to packet idle mode and notify higher layers.

The mobile station is not allowed to make a new attempt for packet access in the same cell until T3142 expires, but may attempt packet access in an other cell after successful cell reselection for radio conditions reasons (see 3GPP TS 05.08). The value of the wait indication (i.e. T3142) relates to the cell from which it was received.

The mobile station may initiate RR connection establishment in the same cell before T3142 has expired, see clause 3.3.1.1.3.2.

3.5.2.1.4 Packet access completion

The one phase packet access procedure is completed at a successful contention resolution. The mobile station has entered the packet transfer mode. Timer T3141 is stopped on the network side. Timer T3164 is stopped on the mobile station side.

3.5.2.1.5 Abnormal cases

If a failure occurs on the mobile station side before a successful contention resolution procedure is completed, the allocated temporary block flow is released; the mobile station returns to packet idle mode, upper layers are notified (TBF establishment failure), transactions in progress are aborted:

- If a TLLI mismatch has occurred during the contention resolution procedure, and the repetition of the packet access has been repeated the maximum number of times as defined in 3GPP TS 04.60, a TBF establishment failure has occurred.
- If the information available in the mobile station, after the reception of an IMMEDIATE ASSIGNMENT message or the second IMMEDIATE ASSIGNMENT message of a two-message assignment, does not satisfactorily define a PDCH, a TBF establishment failure has occurred.
- If the mobile allocation indexes frequencies in more than one frequency band then a TBF establishment failure has occurred.
- If an IMMEDIATE ASSIGNMENT message indicates a PDCH in a non-supported frequency band then a TBF establishment failure has occurred.

On the network side, if timer T3141 elapses before a successful contention resolution procedure is completed, the newly allocated temporary block flow is released as specified in 3GPP TS 04.60 and the packet access is forgotten.

3.5.2.2 Sending an RLC/MAC control message: single block packet access procedure

The sending of an RLC/MAC control message other than the PACKET RESOURCE REQUEST message from a mobile station in packet idle mode to the network may be initiated by the RR entity on the mobile station side using the packet access procedure. If access to the network is allowed (clause 3.5.2.1.1), the packet access is done according to the procedures defined in clauses 3.5.2.1.2 and 3.5.2.1.3, using the single block packet access option defined in clause 3.5.2.1.3.3.

Further action depends on the RLC/MAC control message sent by the mobile station, see 3GPP TS 04.60. Unless otherwise indicated by the RLC/MAC control message, the mobile station remains in packet idle mode.

3.5.3 Packet downlink assignment procedure using CCCH

The packet downlink assignment procedure using CCCH may be used to establish a temporary block flow to support the transfer of LLC PDUs in the direction from the network to the mobile station.

This procedure may also be used to assign a single downlink block on a PDCH to support the transfer of an RLC/MAC control message from the network to a mobile station in packet idle mode, see 3.5.3.2.

3.5.3.1 Entering the packet transfer mode: packet downlink assignment procedure

The establishment of a downlink temporary block flow may be initiated by the RR entity on the network side using the packet downlink assignment procedure. The procedure is triggered by a request from upper layers to transfer a LLC PDU, see 3GPP TS 24.007. The request from upper layers specifies an optional *Priority* level, a QoS profile including the requested *RLC mode*, optional *DRX parameters*, and optional *IMSI* and an optional *MS Radio Access Capability* associated with the packet transfer.

Upon such a request, the network shall determine whether the mobile station is in packet idle mode or packet transfer mode. The packet downlink assignment procedure using CCCH is applicable when the mobile station is in packet idle mode and when there is no PCCCH present in the cell.

The network may allocate a temporary flow identity and assign a packet downlink resource comprising one PDCH for a downlink temporary block flow.

3.5.3.1.2 Initiation of the packet downlink assignment procedure

The network initiates the packet downlink assignment procedure by sending an IMMEDIATE ASSIGNMENT message in unacknowledged mode on the CCCH timeslot corresponding to CCCH group the mobile station belongs to. appropriate CCCH group is calculated from the IMSI, see 3GPP TS 05.02. The behaviour of the network when the RR entity does not receive the IMSI from the upper layers is implementation dependent for the calculation of the CCCH group where the IMMEDIATE ASSIGNMENT message has to be sent. If the mobile station is in non-DRX mode or if the RR entity does not receive the IMSI or the DRX parameters from the upper layers, there is no further restriction on what part of the downlink CCCH timeslot the IMMEDIATE ASSIGNMENT message, or the first part of the IMMEDIATE ASSIGNMENT message (in the case of a two-message assignment), can be sent. If the mobile station applies DRX, the IMMEDIATE ASSIGNMENT message, or the first part of the IMMEDIATE ASSIGNMENT message (in the case of a two-message assignment), shall be sent in a CCCH block corresponding to a paging group determined for the mobile station in packet idle mode, see 3GPP TS 05.02.

The IMMEDIATE ASSIGNMENT message contains:

- the packet channel description;
- the initial timing advance;
- the packet downlink assignment construction

The contents of the packet downlink assignment construction determines the further action. At the establishment of a downlink temporary block flow, the packet downlink assignment construction shall contain:

- the TLLI;
- the temporary flow identity;
- the RLC mode;
- the power control parameters;
- the polling bit;
- the initial timing advance validity flag;
- optionally, EGPRS Window Size (see 3GPP TS 04.60) and Link Quality Measurement Mode (see 3GPP TS 04.60);
- optionally, the timing advance index (see 3GPP TS 05.10);
- optionally, the TBF starting time.

If frequency hopping is applied, the network may use the indirect encoding or the direct encoding of the frequency configuration in the *Packet Channel Description* information element. If the indirect encoding is used, the mobile station uses information received in system information or stored from a previous assignment to determine the frequency parameters, see 3GPP TS 04.60. If the direct encoding is used, the mobile station uses the cell allocation defined for the cell to decode the mobile allocation.

If the *indirect encoding* is used, the IMMEDIATE ASSIGNMENT message may contain a CHANGE_MARK_1 field. If that is present, the mobile station shall verify the validity of the SI *change mark* associated with the GPRS mobile allocation to which the message refers, see 3GPP TS 04.60. If the CHANGE_MARK_1 field and the SI *change mark* do not match, the message does not satisfactorily define a PDCH.

If the mobile station receives an IMMEDIATE ASSIGNMENT message and the *Dedicated mode or TBF* information element indicates that this is the first message in a two-message assignment, the mobile station shall start listen to the full CCCH. The network may send a second IMMEDIATE ASSIGNMENT message to the mobile station within two multiframe periods following the first IMMEDIATE ASSIGNMENT message, specifying the packet channel description and, if required, a mobile allocation for the assignment. The two IMMEDIATE ASSIGNMENT messages in a two-message assignment shall have the same contents of the *Request Reference* information elements.

If the mobile station was operating in DRX mode when it received the first message of a two-message assignment, the network shall not send the second IMMEDIATE ASSIGNMENT message within the two block periods immediately following the first message.

If the mobile station does not receive the second IMMEDIATE ASSIGNMENT messages in a two-message assignment within two multiframe periods following the first message, the mobile station shall discard the first IMMEDIATE ASSIGNMENT message received. After the two multiframe periods following the first message, the mobile station may resume to DRX mode.

On receipt of an IMMEDIATE ASSIGNMENT message or, in case of a two-message assignment, a matching pair of IMMEDIATE ASSIGNMENT messages, the mobile station stops monitoring downlink CCCH and switches to the assigned PDCH and starts listening for downlink RLC/MAC blocks identified by the assigned TFI; it starts timer T3190.

The IMMEDIATE ASSIGNMENT message may indicate a TBF starting time. If the mobile station receives the message before the TBF starting time has expired, it shall wait until the frame number indicated by the TBF starting time, start timer T3190 and switch to the assigned PDCH. If the mobile station receives the message after the TBF starting time has expired, it shall ignore the indicated TBF starting time, immediately start timer T3190 and switch to the assigned PDCH.

When the mobile station switches to the assigned PDCH, it shall take the power control parameters received in the IMMEDIATE ASSIGNMENT message into account, perform signal strength measurements and apply output power control procedures as they are defined for packet transfer mode, see 3GPP TS 05.08.

If the Polling bit is set to 1, MS shall send a PACKET CONTROL ACKNOWLEDGEMENT message (see 04.60) on the assigned PDCH, in the uplink block specified by the TBF Starting Time. In this case the TBF Starting Time is used both to indicate when the assigned PDCH becomes valid and to specify the uplink block. If the TBF Starting Time is not present or has expired, the MS shall ignore the polling request.

An IMMEDIATE ASSIGNMENT message may indicate a timing advance index (TAI) in the packet timing advance IE. The mobile station shall then use the continuous update timing advance mechanism, see 3GPP TS 05.10, using PTCCH in the same timeslot as the assigned PDCH. If there is no indication of a timing advance index, the continuous update timing advance mechanism shall not be used.

The TA_VALID flag indicates if the value of the *Timing Advance* IE is valid or not.

If the network does not have a valid timing advance value for the mobile station to include in the IMMEDIATE ASSIGNMENT message, the network shall use the procedures defined in 3GPP TS 04.60 on the assigned TBF, or the polling mechanism defined in the above paragraph if the PACKET CONTROL ACKNOWLEDGEMENT format is set to four access bursts, to obtain a timing advance value and to update the initially assigned timing advance value before the mobile station is required to transmit other than access burst on the newly assigned channel.

The packet downlink construction may optionally contain the EGPRS Window Size (see 3GPP TS 04.60) and Link Quality Measurement Mode (see 3GPP TS 04.60). The presence of these fields indicates EGPRS TBF mode (see 3GPP TS 04.60). If these fields are not present, this indicates GPRS TBF mode.

3.5.3.1.3 Packet downlink assignment completion

After having sent the packet downlink assignment, the network starts sending downlink RLC/MAC blocks on the assigned packet downlink resource and the packet downlink assignment procedure is completed at the network side.

On the mobile station side, the procedure is completed when the mobile station receives an RLC/MAC block identified by the assigned temporary flow identity. The mobile station stops timer T3190. The mobile station has entered packet transfer mode.

3.5.3.1.4 Abnormal cases

If a failure occurs on the mobile station side before the packet downlink assignment procedure is completed (TBF establishment failure), the temporary block flow is released; the mobile station returns to packet idle mode:

- If the mobile station does not receive a RLC/MAC block on the assigned PDCHs before timer T3190 expires, then a TBF establishment failure has occurred.
- If the information available in the mobile station, after the reception of an IMMEDIATE ASSIGNMENT message or the second IMMEDIATE ASSIGNMENT message of a two-message assignment, does not satisfactorily define a PDCH, then a TBF establishment failure has occurred.
- If the mobile allocation in the frequency parameters indexes frequencies in more than one frequency band, then a TBF establishment failure has occurred.

If an IMMEDIATE ASSIGNMENT message indicates a PDCH in a non-supported frequency band, then a TBF establishment failure has occurred.

3.5.3.2 Sending an RLC/MAC control message: single block packet downlink assignment procedure

The sending of an RLC/MAC control message to a mobile station in packet idle mode may be initiated by the RR entity on network side using the packet downlink assignment procedure. The procedure is used to assign a single downlink block on a PDCH for the transfer of the RLC/MAC control message. Using this procedure, the network shall not apply segmentation of the RLC/MAC control message.

The single downlink block assignment is done according to the procedure defined in 3.5.3.1.2, with the following exceptions:

The packet downlink assignment construction in the IMMEDIATE ASSIGNMENT message shall contain only:

- the TLLI; and
- the TBF starting time.

If the mobile station receives the IMMEDIATE ASSIGNMENT message before the TBF starting time has expired, it shall wait until the frame number indicated by the TBF starting time. The network shall use the TBF starting time to indicate the first frame number belonging to the single block period assigned to the mobile station. The mobile station shall switch to the assigned PDCH and attempt to decode an RLC/MAC control message in the assigned downlink block. Further action depends on the RLC/MAC control message sent by the network, see 3GPP TS 04.60. Unless otherwise indicated by the RLC/MAC control message, the mobile station remains in packet idle mode. If the mobile station remains in packet idle mode, it shall continue to monitor downlink CCCH once the block period indicated by the TBF starting time has passed.

If the mobile station fails to decode or does not receive an RLC/MAC control message in the assigned downlink block, it shall remain in packet idle mode and continue to monitor downlink CCCH once the block period indicated by the TBF starting time has passed.

If the mobile station receives the IMMEDIATE ASSIGNMENT message after the TBF starting time has expired, it shall ignore the assignment.

If a failure occurs on the mobile station side due to any other reason, the mobile station shall ignore the assignment.